

# METAL INDUSTRY

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## Editorial

### Recovery — Continued

A month ago in these columns we pointed with restrained optimism to the upturn in business.

Today we point with the same optimism, to the fact that the upward trend has been sustained.

Reports from the brass manufacturing centers of Connecticut show that they are definitely increasing their schedules; payrolls rising and freight in and out, increasing. The operating rate of the steel industry has risen to 44%. The large automobile plants in and near Detroit have started intensive operations and according to newspaper reports, thousands of workers have been recalled. Plating supply houses report large orders from the automobile companies. Lastly, a report from the Consumer Goods Industries Committee reveals a "definite improvement in business morale."

From all of these signs, the present improvement in business is unmistakable. Whether the upturn has the quality of permanence, however, is something else again. It has often been pointed out that all of our important business recoveries from depressions have been sustained by increased expenditures by business enterprises for enlarged plants, improved equipment and the financing of new undertakings. At the present time, few of such increases have appeared. As far as we can see, improvement rests upon the present or prospective expenditures of the Government under the "Spend and Lend" program.

For the long pull, predictions cannot be made. For the next few months, although the rate of increase is still slow and business activity is still far below normal, the prospects are promising for continued recovery.

### Industrial Plating

That the electroplating industry is only beginning to "get its growth" is the firm belief of the leaders of the industry. There are many square miles of new industrial territory for it to fill. Of special value, therefore, is the indication of a very considerable new region by Dr. W. A. Wesley in an article entitled, "Physical Properties and Uses of Heavy Nickel Deposits," concluded in this issue of METAL INDUSTRY.

The plating of heavy deposits of metals (which is given

the interesting name "cold casting") is far from new. Electrotyping is one of its oldest products. But little by little additional items have joined this group. Phonograph record matrices, medals, bi-metal sheets for kitchen utensils and screens for various industrial uses (made by electrodeposition instead of weaving) are among the best known. In addition we have the use of heavy nickel deposits for "building up," salvaging and reclaiming parts which have been mismachined or worn down in service.

We agree with the author that engineering uses offer a broad new realm for the electroplating industry; that not enough use has been made of electroplating as an industrial process in the past and that a very important share of its future growth may take place in this direction.

### Long Pull Optimism

To confound the pessimist—for whom we have no use—who says that America has reached its

peak, that we have no more room for expansion, that "we are through"—we ask permission to quote a few round figures from American vital statistics.

Even under the American standard of living (the highest in the world) 70% of the 27,000,000 American families have an average income of only a little over \$1,000 per year. Of this they must spend more than half for food and clothing. As a result, the average American family lives in a home which is far below the level of the food it eats and the clothing it wears.

Quantity production which has made manufactured consumer products available to greater numbers than ever before in our history, has hardly touched private home construction. Consequently, we find refrigerators and radios installed in the homes approaching delapidation. Quantity construction of homes is not yet here, but we know that many minds are working on this problem, recognizing it as one of the largest of the coming industries. When it does arrive, it will carry with it metal products and metal finishes in record-breaking volume as no materials lend themselves better to quantity, labor saving production and manufacture.

That is our answer to the pessimist. A rise in standard living will bring greater prosperity than we have ever dreamed of.

# Production Plating of Business Machines

The National Cash Register Company plates 1,500,000 parts per day under controlled operating conditions.

## *Enormous Quantity and Variety of Work*

**D**UE to the highly specialized type of product manufactured by the National Cash Register Co., Dayton, O., their plating department is required to handle a great variety of work, ranging from extremely small to quite large parts occupying several cubic feet of space.

Approximately 30,000 different parts are regularly put through the various pickling, cleaning, or plating operations in this plant, at the rate of more than one and one-half million pieces every 8-hour working day. In all, 67,000 items required for making National cash registers and accounting machines are carried in the various stock rooms.

The greater part of the work plated in this plant consists of copper, nickel, chromium and zinc. However, considerable amounts of brass, bronze, lead, silver, gold, and black nickel plate, oxidized and special finishes and anodized and dyed aluminum are produced. A considerable volume of work is copper-stripped or pickled after heat treating operations, and a great deal of cleaning before enameling, either by the use of alkaline cleaning baths or degreasers, is required. In fact, practically all types of work commonly encountered in electroplating plants is done in this plant.

## *Waterproof Floors*

Due to the fact that the plating department is located on the third and fifth floors of a steel framed brick building, waterproof floors are somewhat of a problem. Acid proof brick or tile, set in cement, proved unsatisfactory, due to cracks caused by vibration of the building. The problem was quite satisfactorily solved by use of a composition floor made up as follows: first a solid sub-floor is laid,

with the proper slope toward the drains which are located every forty feet along the walls. On this is placed two-inch cypress with the edges grooved to receive a  $\frac{1}{2}$ " x  $\frac{1}{4}$ " spline. After the splines are inserted, the cracks are filled with hot asphalt and ironed smooth with a hot iron. A coat of hot asphalt is next flowed on, and five layers of tar paper, each with a coat of hot asphalt, are laid down. The final coat consists of hot asphalt flowed on and immediately covered with pea-size gravel. The gravel sinks into the hot asphalt and offers considerable resistance to wear. The result is a very satisfactory waterproof floor which does not crack or chip and which will last for years if much used. Sections are protected by wooden gratings or "duck boards."

## *The Nickel Installation*

Over 16,000 gallons of nickel solutions are used in tanks ranging in size from 60 gallons to 7,500 gallons.

Current densities used on nickel baths range between 25 and 50 amperes per square foot and operating temperatures range between 120 and 150°F on all except a few special solutions which must be run at room temperature. All but 1,000 gallons of the total nickel solution used is run at a pH of 2.50. This results in better anode corrosion and freedom from sludge. By maintaining these solutions at the proper chloride concentration, more than 90% of the nickel consumed is supplied from the anodes, and the solution always tends toward the alkaline side. Very small additions of nickel sulphate and no alkali are therefore required.

Filtration of all large nickel solutions is accomplished by permanent installations of plate type filter

presses, while small tanks are serviced by portable filter presses. All nickel solutions, as well as sulphuric acid solutions, are handled by Duriron pumps. The use of silica powder has resulted in faster filtration and cleaner solutions. All anodes are bagged with bags made in one of the plant departments from special heavy Navy twill.

## *The Copper Installation*

Ten thousand gallons of copper solution are used in tanks ranging in size from 60 gallons to 3,000 gallons; 1,750 gallons of this total is acid copper solution which is used on a special type of work on which certain areas are stopped off with a resistant material which prevents copper deposition on these areas. Practically all of the remainder is the Rochelle type bath, which has been found much more economical to operate and much easier to control than the ordinary copper cyanide solution.

Most of the copper deposited in this plant is on work which is to be subsequently heat treated. Areas which are protected by a minimum of .0005" of copper are not penetrated by carbon. A considerable quantity of strip steel is plated for this purpose. In this case the cash register parts are punched out on a punch press, leaving the edges which must be hardened, free from copper. A simple drop test has been devised to measure the thickness of the copper deposit, and each lot is carefully checked before it is allowed to leave the department.

## *The Zinc Installation*

Two thousand two hundred and fifty gallons of bright zinc solution are in use. Bright zinc was installed to

meet the demand for a better appearance of the internal parts of the cash register and accounting machines. The installation includes a battery of plating barrels and one full automatic plating machine.

### **Chromium**

1,200 gallons of chromium solution are used for decorative plating. This solution is the standard 400 g/l chromic acid-sulphate bath.

### **Anodizing and Coloring Aluminum**

A 500-gallon anodizing bath is used to apply a hard resistant coating on the cast aluminum cash drawers and coin trays used in National cash registers. This cash drawer was developed to supply the demand for a moisture resistant cash drawer for use in bars, soda fountains, restaurants and markets. A smooth, even finish is applied on these castings, before anodizing, by ball burnishing. This is accomplished in a side opening cylinder about six feet in diameter, using about 3,000 pounds of  $\frac{1}{4}$ " steel balls. This cylinder is equipped with fixtures around the inside circumference into which the drawers are inserted during the burnishing process. Neutral soap and soft water are used for the lubricant. The cylinder of this machine is made of two compartments in such a manner that the balls can be transferred to the second compartment while loading or unloading work in the first.

Other types of work such as counter wheels turned from aluminum rod are anodized and dyed black. When the characters on these black wheels are filled with white, a striking and permanent contrast results, making the reading of the various counters easy and accurate. One feature of this installation is the cooling arrangement. The electrolyte is pumped by means of a Duriron pump through lead coils, which are immersed in a box through which is circulated water from the Company's private wells. The temperature of this water remains at approximately 57° F throughout the year. By proper regulation of the flow of cold water, the temperature of the electrolyte is held within the proper range.

Several hundred gallons of various

other plating solutions are maintained in readiness at all times to handle practically any job the department may be called upon to produce.

Storage tanks, located either on the roof or on the ground, permit easy transfer of the larger solutions from their regular tanks when anode bags must be replaced and tanks thoroughly cleaned. During cold months, carbonates are sometimes removed by freezing in one of these tanks.

### **The Cleaning Department**

Approximately 15,000 gallons of alkaline cleaning baths are operated. Most of these solutions are made from formulas developed at this plant, and are chemically controlled the same as a plating bath. In cleaning nickel before chrome plating, the work is made cathode in the electric cleaners. All steel and buffed copper are cleaned as anodes in the electric cleaners after soak cleaning. Brass and zinc base die castings are given a short strike as anode after degreasing and soak cleaning.

About 1,200 gallons of trichloroethylene is used in three degreasers for removing oil and grease from plated work before the regular alkaline cleaning procedure.

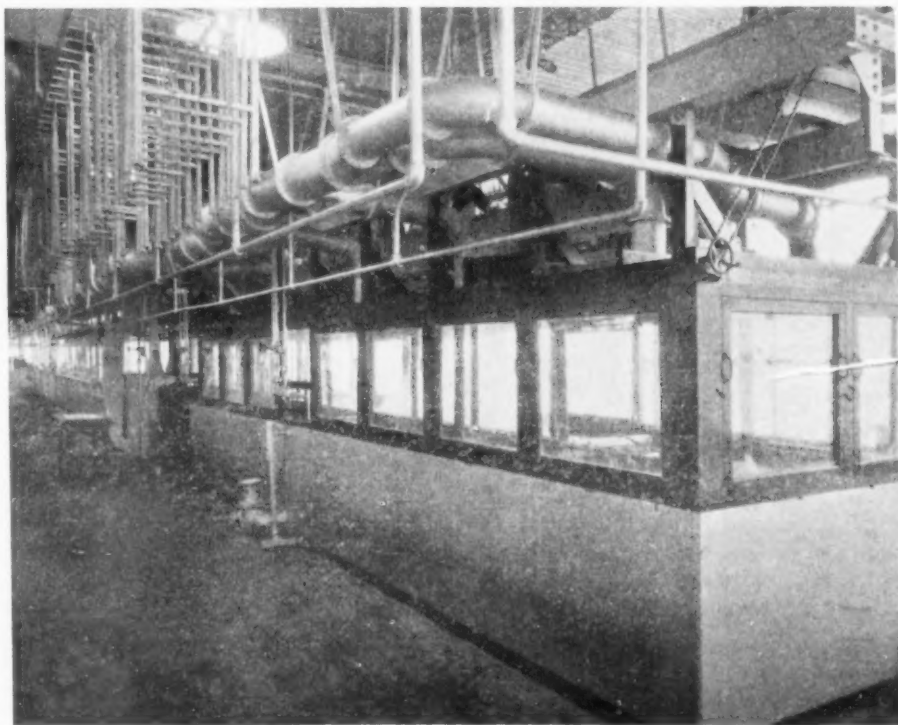
### **Temperature Control**

All plating and cleaning solutions requiring heat are thermostatically controlled to assure a constant uniform temperature. The direct acting type of regulator is used in general. However, when extreme accuracy is desired, either the air or electrically actuated type is sometimes used.

### **Equipment Used**

A total of more than 65,000 amperes from 27 motor generator sets is available for the various cleaning and plating processes in this plant. Where necessary, separate generators are used for each tank, and where it is practical, generators are connected direct to the tank without the use of tank rheostats.

One feature of this plant is a chain conveyor traveling the length of one floor, or 600 feet. This conveyor is used for transporting parts of the metal cabinets used for housing the cash register mechanism to the various polishing, plating and buffing operations. At one stage, a degreaser is placed in the circuit in such a manner that all parts leaving the polishing room are automatically degreased as they pass along. This degreaser is so constructed and situated that the vapor



*Fig. 1. Nickel plating machine, showing glass hood over tanks and lead exhaust pipes.*

losses are remarkably low and the cost of degreasing is quite low.

Four full automatic machines and two semi-automatic plating machines are in use. These machines are used on copper, nickel, zinc and chromium. Due to the nature of the work in this plant, it has been found most satisfactory to use the composite bus-bar system for handling the greater part of the chrome plated work. With this arrangement, complicated set-ups may be readily made outside the tanks and then the whole set-up may easily be transferred to the plating tank by the use of an electric crane.

### **Barrel Plating**

Barrel plating equipment for the most part consists of straight line set-ups on which the cylinders are handled through cleaning, pickling, rinsing, plating and drying by means of an electric crane. The work is tumbled in the cleaning baths in monel metal cylinders. Pickling and rinsing are accomplished in the same cylinders and then the work is transferred by means of a chute to either hard rubber or Bakelite cylinders for plating. After plating, the work is dumped into a series of scoops by means of which it is run through several rinses and finally dumped directly into a centrifugal dryer.



*Fig. 2. Nickel plating machine, showing conveyor chain, overhead rack storage and lead exhaust system.*

### **Plating Racks**

Approximately 2,000 plating racks are in regular use. These racks are either rubber or Korolac covered. All plating racks are designed and made in the NCR plant. In most cases the frames are cast in one piece and machined to receive replaceable hooks and tips. These tips are made of spring steel and are clipped over projections on the bars of the racks. Approximately 500,000 of these replaceable tips are used every year. All Korolac insulation is applied in the plant which is completely equipped for this work. With this set up it is possible to have new racks in service in a very short time and to keep all racks in an excellent state of repair at all times. The use of cotton tape in connection with Korolac has resulted in prolonging the life of the insulation for a considerably longer period. Racks which require that the insulation adhere tenaciously to the metal must be rubber covered for best results.

### **Controlling Fumes**

The problem of controlling fumes from acid tanks as well as steam and spray, has been well handled in this plant. All tanks giving off undesirable fumes are well hooded and provided with ample suction. The greater part

of the piping for the exhaust system is built from 1/16" sheet lead. The first cost for this type of system is considerable, but in the long run it more than pays for itself due to its extremely long life compared to galvanized iron. Where lead will not stand up in acid fumes, rubber lined pipe has proven very successful except in the case of nitric acid. For nitric fumes, wood pipe impregnated with asphalt is fairly satisfactory.

It has been found highly satisfactory and economical to segregate the pickling and bright dipping jobs from the remainder of the department. This was done by installing them in a large pent house on the roof of the building. A great saving in upkeep due to prevention of corrosion of equipment has resulted. Where acid tanks are required in the main part of the plating plant, exhaust fans over these tanks are kept running constantly day and night.

### **Handling the Work**

With the exception of the bulky pieces which are carried through the department on trucks or chain conveyors, all work enters and leaves in wooden tote boxes. Transportation of these boxes of stock, which never exceed 100 pounds in weight, is accomplished by a system of belt and gravity roll conveyors which reaches all sections of the NCR plant. Each box is numbered and is accompanied by a routing card which carries all information necessary to identify the stock at any time and to route it through all necessary operations from raw to finished stock.

By means of a running record of each operation completed, carried by the Stock Department, any box of stock may be readily located in the plant at any time. Stock which is wanted quickly and is to have preference over regular production is speeded up by attaching a special sticker to the accompanying routing card. Stock carrying these stickers is operated immediately and sent on to its next operation.

### **Equipment and Solutions Maintained to Standards**

By maintaining equipment in good operating condition at all times, lost production time is kept at a minimum.

and efficient healthful working conditions are maintained. Likewise, maintenance of all solutions at their optimum concentrations and operating conditions makes it possible to maintain production at a standardized level otherwise not possible.

All processes and all formulae used in this plant are covered by written specifications. These specifications are arrived at after thorough tryout and investigation in the department of tests and in actual production in the plant. No changes are made unless they are agreed on by a committee representing both departments.

Maintenance of all solutions within specification limits is accomplished by frequent chemical analysis. Some solutions require certain determinations as often as twice a day, while others require attention no oftener than once a month. The schedule for chemical analysis is made out in advance, and by adhering to this schedule no solution is neglected or allowed to run beyond the safe operating period without attention. In the chemist's daily report which is made on a regular form, recommendations for additions or adjustments of all solutions analyzed are regularly made. A copy of this report is turned over to the head stock keeper who is the only person authorized to make these adjustments. This eliminates omissions and duplications. As all adjustments are checked off as they are made, this report becomes a complete history of every solution in use. In order to facilitate this analytical work, a complete chemical laboratory is located in the plating department.

#### **Checking and Inspection of Products**

Since maintenance of solutions and operating conditions is only one side of the picture, a system of checking and controlling the finished product is in regular use. For instance, on cabinet parts, a minimum of .00075" and a maximum of .0012" of nickel on steel is specified. In order to be sure that this specification is being met, thickness tests are run daily as follows on this class of work:

Each morning, as the plating machine is being loaded, a standard test panel is run through the machine along with the regular work. Just before noon a sample is taken at ran-

dom from the regular run, and again later in the day another sample is taken. Thickness determinations are made either by the microscopic method, or by use of the Brenner magnetic tester. This last named process is preferable since no damage is done to the parts being tested. In the case of large parts, this piece of testing equipment will soon pay for itself.

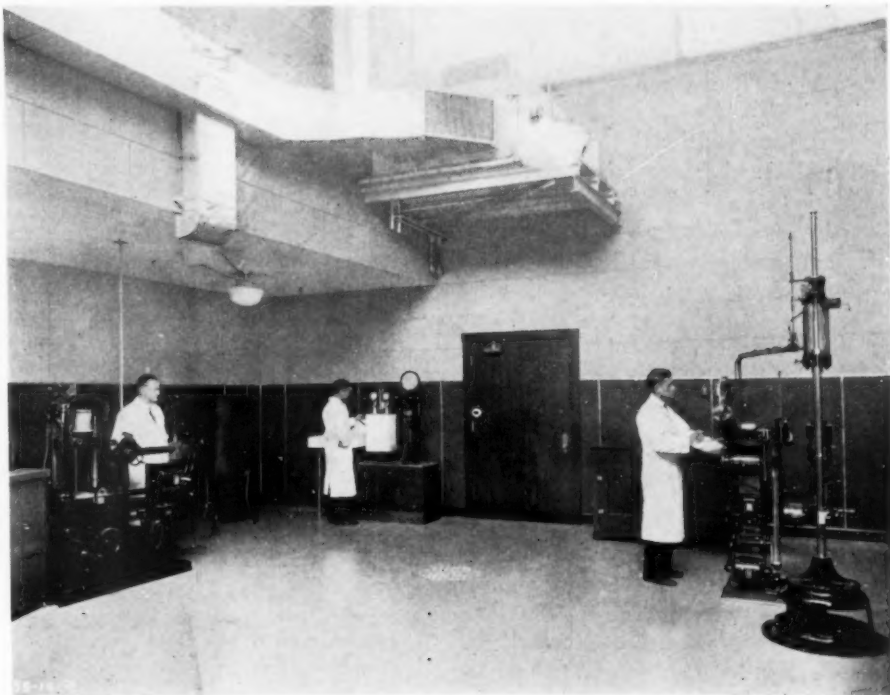
In the case of small working parts which require thinner deposits on account of working limits, specifications require a minimum of .0005" and a maximum of .00075" of nickel. Daily thickness tests taken at random from the day's run are made as above. All decorative chrome deposits are specified to have a minimum thickness of .000008" and a maximum of .00002". Copper deposits, to give protection against carbon penetration during heat treatment of steel, must not fall below a minimum of .0005" and must not exceed .00075" or it will prevent placing of stock on arbors and mill fixtures in subsequent operations. As previously mentioned, a drop test is used in this thickness determination. Zinc deposits for internal register parts is specified at .0001" to .0002".

The Hall & Strausser drop test method is used in determining the thickness of zinc deposits. If samples do not fall within the specification limits, duplicate tests are made, and if this is still unsatisfactory, the entire lot is rejected. By careful control of all factors involved, these rejections are readily held to an extremely low figure.

An information card system installed on all sections where it is required is helpful in listing the peculiarities of the different kinds of stock, and prevents wrong handling due to failure of the plater's memory or unfamiliarity with new or infrequent orders.

Departmental cleanliness, proper safeguards to employees, proper light and ventilation are constantly watched. All operations are, with a very few exceptions, on a piece work basis, which has proved highly efficient and satisfactory to both management and employee. As a result, by proper selection of equipment, constant attention to technical details and good working conditions, this plating plant is turning out a quality product with a minimum of avoidable rejects.

## **A Testing Laboratory de Luxe**



*Installation of the National Smelting Co., Cleveland, Ohio. Mechanical and hydraulic tensile strength machines. Brinell hardness tester. Dilatometer for measuring thermal expansion. Salt spray corrosion testing cabinet. Air conditioning and heating unit.*

# Galvanoplastic Reproductions from Metal Moulds

A process which has become important in the manufacture of grilles, lighting fixtures, tablet bas-reliefs, patterns, phonograph records and other products.

By GEORGE SCHOR

Electroplater and Finisher

THE manufacture of copper galvanos from gutta-percha and wax moulds has become very common in the art of galvanoplasty, but very few are making use of metal moulds. This process has been utilized in such fields of manufacturing as grilles, lighting fixtures, tablet bas-reliefs, in the making of patterns, leather-embossing and wood graining plates and phonograph records for stamping. It has already taken its place as a competitor to the metal caster.

## The Metal Mould

The most important feature of this art is the preparation of the mould which is to obtain an electrolytic deposit. There are two important points that must be considered in the preparation of the same.

1—It should reproduce the finest details of the articles to be made.

2—It should possess a good conductive surface for the electric current at all points where an electrolytic deposit is to be obtained.

Almost all difficulties and causes for not getting a uniform homogeneous deposit on the mould arise from the imperfect way of rendering the surface of the mould conductive. Using lead or its alloys will assure a well-conducting surface, but these metallic substances have so far been used only in few cases and for articles of small size.

The advantages of this process over that generally used are that it eliminates completely, all inconveniences of the old process, such as the long and minute preparation of the shape, the drying up of the same, the preparing to make it conductive for the electric current by means of graphite or other materials, soldering and all other preparation. It assures at the same time the obtaining of all condi-

tions necessary for the production of good copies, with a deposit uniform and homogenous over the whole surface, including the recesses; the reproduction of the finest details, as well as the expenditure of much less time in the electrolytic baths.

The metallic composition which is used to make duplicates of the pattern must possess the following qualities: it must not be fragile; it must have a low melting point; it must have a high conductivity for the electric current.

The following metals will fulfill the



Fig. 1. These two reproductions are examples of work which can be soldered together after the separate parts are reproduced. These are examples of the arsenic dissolved in muriatic acid treatment.

necessary requirements and give best results.

Newton's Alloy		Cerrosafe	
Bismuth	50	Bismuth	40
Lead	31	Lead	40
Tin	19	Tin	11.5
Melting point	201°F	Cadmium	8.5
		Melting point	180°F

Best results for making patterns from the alloy are gotten by spraying on the pattern. Ventilation must be provided for the atomized metals.

In using the spraying apparatus the

alloy should be melted in a small furnace. From this it should be placed in the apparatus, which should be pre-heated and have had compressed air blown through the same so that it should be cleaned. Before spraying the pattern the apparatus should be tried till the metal is seen coming out fine. When this point is reached a first coat should be sprayed, then a second, then a third, until the necessary thickness in proportion to the size of the surface is obtained. Care should be taken that large quantities are not sprayed in the same place at the same time as this will develop a great amount of heat and melt the metal already sprayed and so destroy the details of the mould. The spraying should be done very carefully so that the sprayed metal should not become too hot and this also for the purpose of keeping the mould from shrinking when cold. When the mould is sprayed and the necessary thickness obtained, place a wire in the mould and connect it with the same by further spraying on the wire and around it along its entire length. When the mould is of a large size, it is advisable to provide it with bars for the purpose of giving rigidity and solidity. These wires can be connected to the mould by further spraying of the metal and connection of the same in this way. For spraying the metal alloy use compressed air of about 80 to 100 lbs. pressure.

After the mould has been prepared by spraying, the back sides should be insulated with:

Asphaltum	1 part
Paraffin	9 parts
Brick Dust	4 parts
Plaster	1 part

When the insulation is finished apply to the face of the mould:

Liquid petrolatum .....	3 parts
Vaseline .....	7 parts

When the mould is thoroughly dry it should be black-leaded with a stiff brush.

As soon as this is done it should be washed with clean water. The best way to do this is to lay the mould or 2 pieces of wood which extend across the wash tank and squirt water from a hose on the face of the mould. It is now hung in an acid copper solution, and, if the solution is in good order, the mould will be covered with copper at once and begin to plate.

The following solution is very good for this class of work:

Copper Sulphate .....	28 ozs.
Sulphuric Acid .....	6 ozs.
Water .....	1 gal.

With 3 volts pressure and 40 amperes per square foot an average of .002 of an inch in thickness will be deposited in one hour. After the desired thickness is obtained, the article is removed from the solution, rinsed, insulating material removed, and the duplicate is then ready for trimming and finishing.

The above is the process for manufacturing such articles as lighting-fixtures, ornate drops, etc.

### Galvanoplasty

Galvanoplasty is used in the making of bas-reliefs, reproductions of fine art, making of dies from moulds and for other artistic purposes. The original model is made in either plaster or wax and is used for obtaining the mould which is negative. These moulds may be used as often as is desired in making duplicates which will come out of the solution in their positive form.

The preparation for the solution must be handled carefully. It is advisable to silver plate the negative mould so that the operator may more easily see if he has covered the entire surface of the moulds and not massed any of the fine details or recesses. The back is then insulated with a wax solution such as was described above and the mould is now ready for final preparation. The operator must look at the face of the mould to see that

there are no scratches or defects as this will come out in the positive. If the face is flawless, it is oiled with vaseline, olive or machine oil and dried with a cotton cloth so that only a small portion will adhere to the surface. It is then covered finally with bronze powder so that it is smooth and homogenous along its surface. The edge and sides of the face are then waxed so that the reproduction may more easily be taken from the mould and so that too much copper will not accumulate on its surface.

It is now ready for the solution. It is placed first in a starter solution of both low acid and metal content and at a low current. From this it is placed in the regular copper solution at 1 volt, between 15-18 amperes.

### Phonograph Records

I should like to discuss at this point, an industry which has recently been progressing by leaps and bounds after a long drop which was caused by the

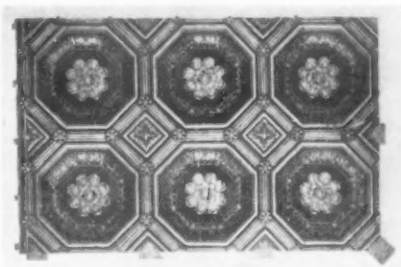


Fig. 2. A reproduction of a section of a pattern. The original was 5 ft. long and 3 feet wide. This reproduction was carried out by means of graphite.

advent of radio. This is the manufacture of phonograph records as reproduced from metal moulds. The general process of manufacturing is more or less familiar to platers. It consists of first having the sound recorded on a wax disc. This disc is then rendered conductive by means of a conducting material such as graphite or bronze powder, and copper deposited on it. This shell, so deposited, is known as the "master," and upon the reproduction of another shell obtained electrolytically and negative to the "master" we have a "mother" shell. From the "mother" by reproduction electrolytically is obtained the "stamper" shell.

Although these shells are built up in copper it is necessary to nickel face them as this presents a more satisfac-

tory method of separation from mould to mould. Also the copper-faced shell is of no value in stamping as the material would hold to the face.

### The "Master" Shell

The copper shell reproduced from the wax disc is known as the "Master" shell. The wax disc is treated with a graphite mixture of which there are many. The most effective of the less expensive type is a mixture of:

Ceylon Graphite .....	10 ozs.
Silver Nitrate .....	1 oz.
Water .....	1 pt.

The ingredients are mixed well and heated in a porcelain dish over a water-bath until dry. The mixture is now placed in a crucible and heated to a red heat. It is allowed to cool, ground in a mortar and passed through a fine sieve, about 200 mesh, and sifted onto the wax mould. This is now treated like the other, by brushing on carefully by hand and then by the graphiting machine where it will receive a very high polish. The loose particles are dusted off and the disc rinsed in clean, cold, running water, and is then ready for the bath.

It is first placed in a copper strike solution for a half-hour, which is made as follows:

Copper Sulphate .....	20 ozs.
Sulphuric Acid .....	2 ozs.
Water .....	1 gal.

Current density—10-12 amperes per 10 inch record. It is then placed into another copper bath for building it up, to between .045 and .050 inches, using a current density of 50 amperes per square foot. This thickness will be reached in about 7 hours in the following solution:

Copper Sulphate .....	28 ozs.
Sulphuric Acid .....	7 ozs.
Water .....	1 gal.

To this solution add a solution of phenol-sulphonic acid prepared by dissolving one pound of the acid by weight to one pound of sulphuric acid; 6 milliliters of this solution should be added to each gallon of solution.

The disc is loosened from the wax by means of a small blade by first lifting at the edges. The shell is now cleaned with benzine or gasoline to remove all traces of the graphite. It is then cleaned thoroughly by brush-

ing with precipitated chalk, and then placed in a nickel solution for a thin shell. This solution is prepared as follows:

Single Nickel Salts	....	8 ozs.
Double Nickel Salts	....	4 ozs.
Boric Acid	.....	3 ozs.
Ammonium Chloride	....	2-2½ ozs.
Water	.....	1 gal.

Use between 1½ and 2 volts.

### The "Mother" Shell

This shell is produced from the Master and is the mould of the "Stamper" shell. It is obtained by electrolytic deposition on it from the Master in the following manner.

The Master, after having been nickeled, is treated with caustic, cleaned with chalk and dipped into a ten per cent solution of sulphuric acid. This is now treated with a solution of potassium bi-chromate for from 1 to 3 minutes. The solution is prepared by dissolving the bi-chromate in water until it reads 1 on the hydrometer and adding 1/16 of an ounce of borax to a gallon. The shell is then placed into the above nickel solution for about 15 minutes to obtain a thin coating and is then built up in the phenol-acid copper solution. The "Mother" shell, so obtained, is nickeled as was the Master and cleaned in the same manner. This shell will be used as a mould for all Stampers which are to be produced and is the positive reproduction of the record.

### The Stamper Shell

The Stamper shell is the one actually used in the commercial stamping of the records. The shell is prepared in very much the same way as the Mother is produced from the Master. The Mother is cleaned and plated in the above nickel solution for about 10 minutes, cleaned again, treated with potassium bi-chromate solution, and placed in a nickel solution for 1½ hours at the rate of 30 amperes per square foot. The solution is made up of 24 ounces single nickel salts; 1 ounce double nickel salts; 2 ounces boric acid; 2 ounces ammonium chloride; one gallon of water; temperature, about 112°F. The Mother is

removed from the nickel bath, rinsed with water and flashed in the preliminary copper bath for about 5 minutes at about 2½ volts and finally placed in the copper bath with an agitator and a current density of 110 amperes per square foot for 4 hours. The shell is then taken out, rinsed with water, dried and the two separated. This third shell has a nickel coating of about .004 of an inch in thickness, backed with copper. This shell is machined and used to press records.

### Patterns from Metal Moulds

Finally, I should like to discuss the line in galvanoplasty which is competitive to the metal casters. This is the reproduction of patterns from metal moulds.

Where large quantities of plain work are made, i.e., work with no undercut, the metal mould process can be carried out to great advantage as it may easily be prepared and is everlasting. This has been used very successfully for both copper and silver reproductions. After the mould is obtained it takes a short time to prepare it. A mould 4x5 feet may be prepared and placed in the bath in 25 minutes. These moulds contain from 100-200 patterns. Since no fuel or crucibles are necessary for melting, and all scrap metal may be used for anodes the cost of the product will be reduced considerably. Its preparation is worked as follows:

The pattern or a number of patterns are finished by polishing all plain parts and soldered to a brass or copper plate. It is then cleaned to remove all solder acid and dried thoroughly. The back and sides are painted with wax and a wire soldered to the back.

For sensitizing the surface the Silver Iodide treatment is effective.

The mould is cleaned by ordinary caustic treatment and is coated with the following solution:

- I. Silver Nitrate ..... 12 ozs.  
Distilled Water .... 1 gal.
- II. Sodium Chloride .... 26 ozs.  
Distilled Water .... 1 gal.

Mix both solutions together and the Silver will precipitate out as silver

chloride. The precipitate is then washed.

- III. Sodium Cyanide ..... 15 ozs.  
Distilled Water .... 1 gal.

When the sodium cyanide has been dissolved by the water, this solution is added to the silver chloride gradually and with vigorous stirring. The resulting solution is then filtered.

Finely divided calcium carbonate is then added until a thin creamy paste is obtained. This paste is placed on the mould and then immersed in a solution containing ½ oz. resublimed iodine dissolved in 1 gallon of denatured alcohol.

The iodide solution may be made with 10 oz. of silver chloride instead of using silver nitrate. In this way precipitating the chloride with the subsequent washing and filtering operations may be eliminated.

The mould is now ready to be placed in the copper solution. Other materials such as potassium bichromate which was discussed above, and white arsenic dissolved in muriatic acid may also be used. In the reproduction of fine recess and undercut work the graphite treatment is recommended. The handling of graphite on copper moulds has been discussed above.

The patterns are placed in the solution at 20 amperes per square foot and the current raised from time to time until finally a density of 40 amperes is reached.

When the mould is finished, it is washed, dried and separated from the pattern with a dull knife. The mould is now backed up with solder to stiffen it, cleansed, dried and treated as was the original pattern; placed in the bath and allowed to plate as before. When the positive is gotten from the mould every line of the chaser's tool, no matter how fine, will show clearly.

In recent years, the importance of metal moulds in the reproduction of galvanoplasty has made itself more evident. Its possibilities are infinite and uses limitless. Every year it is proving more useful to the galvanoplayer. This report is by no means a complete record of this art but merely an attempt to present some of its uses and the methods in commercial practice.

## Etching Pewter\*

THE time-honored methods of decorating the surface of pewter objects are chasing and hand-engraving.

The chief advantages of acid-etching are the ease with which it can be done and the simplicity of the equipment required. Its disadvantages—at least from the metalcraft standpoint—are those that are inherent in a mechanical process as opposed to a hand-worked procedure.

Acid-etching lends itself most readily to the embellishment of flat objects such as trays, dishes and shallow bowls. However, with proper equipment and a wise choice of design, pleasing results have been obtained on irregularly shaped objects such as candle-sticks, vases, ash-trays and the like.

The tray shown in the accompanying photograph is a good example of a well-executed etched design. This tray—recently on exhibition at the Eastern Arts Convention in the Hotel Statler, Boston—was made by a student in the American Handicraft Company school which conducts classes in New York and Los Angeles. The following description of its construction gives a picture of the general pro-

cedure to be employed in etching any pewter object.

The tray was made from a sheet of 14 gauge Hoyt Genuine Pewter 9 inches by 15 inches. The first step was to clean thoroughly one side of the sheet with fine 000 steel wool. This gave a smooth, satin finish, which insured sharp, even etching. The next operation was the selection and application of the design on the flat metal.

The design chosen—a coach and four—was traced in outline on white paper from a calendar illustration. The tracing was then transferred to the surface with carbon paper. So that there would be a clear-cut outline for etching, the metal was gauged out lightly along the carbon lines with a scriber. The remaining carbon was then washed away.

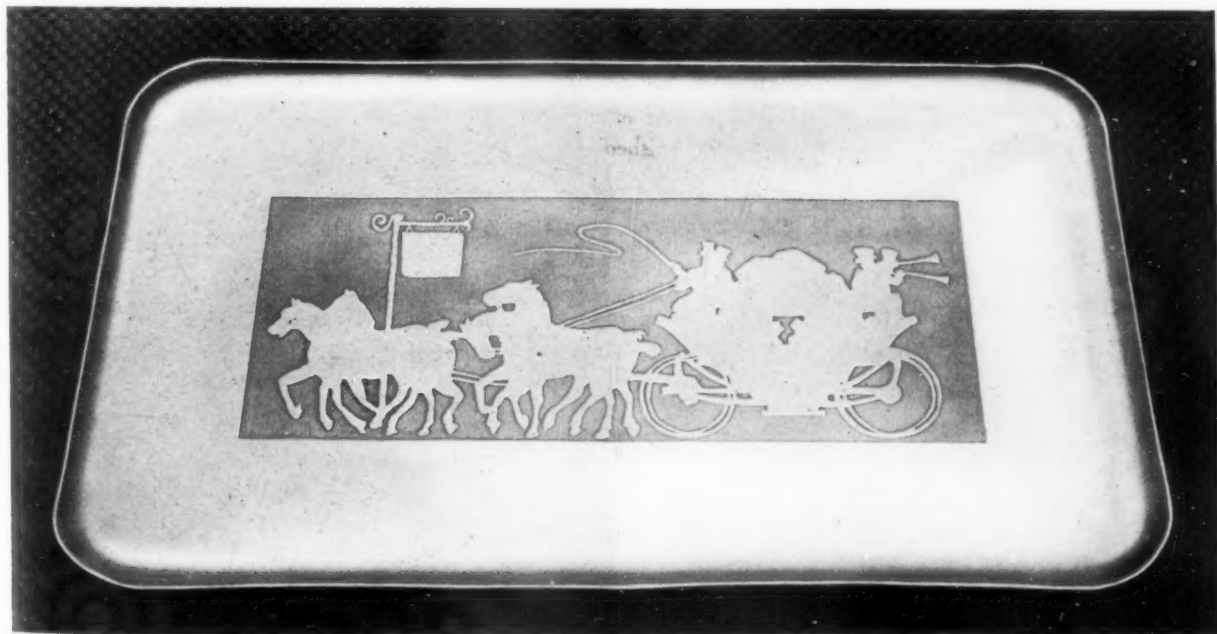
All parts of the flat sheet not to be etched, including the reverse side and the edges, were then painted with a thick coat of black asphaltum. (Black asphaltum is a special type of acid-resistant paint widely used by commercial engravers. It is stocked by most handicraft suppliers.) Special care was taken to leave no thin spots of air holes in the coating. Careless application of the asphaltum may result in pitting of the metal.

When the asphaltum had dried thoroughly, the sheet was immersed in a previously prepared etching solution. The solution consisted of dilute nitric acid, i.e., one part of concentrated commercial nitric acid to two parts of water. It was prepared in a glass pan in which the water first had been placed and then the acid added slowly. This procedure is to be recommended over the reverse procedure of adding water to the acid. With some acids the sudden addition of water produces a more or less vigorous reaction. In placing the metal in the solution and in removing it, rubber gloves were used as a protection for the hands.

About fifteen or twenty minutes was allowed for the etching. This is sufficient time for most etching work except where a very deep design is required. While the sheet was in the solution, the exposed surface was brushed lightly to insure a smooth, even etch. When the design was completed, the metal was removed from the pan, washed thoroughly with water and the asphaltum removed with turpentine and fine 000 steel wool.

With the etching complete, the tray was ready for shaping. First the corners were rounded off with a pair of tinner's shears and all edges filed with a semi-coarse file and smoothed down with emery cloth and steel wool. The edges were curved by beating with a leather-covered wooden mallet over a hard-wood stake. The tray was then ready for the final polishing.

\*From the Dutch Boy Quarterly.



*Pewter tray etched by a student in the American Handicraft Co. school.*

# The Cost of Nickel Plating

A comparison of the costs of plating light and heavy coats of nickel: .001" vs. .0001", in the case of plumbing fixtures.

By JOSEPH HAAS

THE drawing up of plating specifications for Government purchases by the U. S. Bureau of Standards, and the cooperative work between a committee of the American Electro-Platers' Society and the American Society for Testing Materials along broader lines with recommendations to the metal trades using electroplating processes, has resulted in various specifications for plated products. The thickness specification is the most exacting in addition to raising the question, "How much does it cost?"

Distribution of electro-deposits has been made the subject of many articles, covering all the variables. Therefore, when a thickness specification has to be met, it is requisite

that the article be so located in the plating tank that it receives at least the minimum deposit, regardless of the fact that articles more favorably situated will be "over-deposited". It is possible by various means to control this difference between minimum and maximum deposits but these methods are not within the scope of this article.

Our problem is:

1. What is the difference in the cost of plating an article with .0001" of nickel and .001" nickel?

2. How much difference would there be in the total cost of the job?

All machining and fitting operations in this problem are identical,

regardless of the thickness of the plate. The same applies to polishing before plating. Therefore, we will start with the articles racked and ready to plate.

Standard factors:

1. Area of plating surface of 200 bathroom faucets, including racks—10.0 sq. ft.

2. Current density, per sq. ft.—8 amperes.

3. Cathode efficiency—assume 100%.

4. Thickness of nickel deposited in 1 hour, per sq. ft., by 1 ampere—0.0000528".

5. Thickness of nickel deposited in

TABLE 1. 0.0001" Nickel Deposit

Operations	Machine Hour		Overhead		Metal Deposited		Cost
	Time hrs.	Rate per hr.	Labor cost	Pltg. time hrs.	Rate per hr.	Amount 48 c. per lb. 3 c. oz.	
1. Clean rinse and place in tank	.1400 (8 2/3 min.)	\$.60	\$.0840				
2. Plating time*				.3013 (18 3/4 min.)	\$1.00	*.96 oz. @3c. per oz.	\$.0288
3. Remove from tank, rinse, dry	.0500 (3 min.)	.60	.0300				
4. Unrack and place in box	.0666 (4 min.)	.40	.0266				
5. Color nickel plate (P. W. 80c. per 100)			1.6000				
Totals of costs			\$1.7406				\$.0288

\*25% increase to allow for minimum deposit and removal of deposit in nickel coloring.

TABLE 2. .001" Nickel Deposit

Operations	Machine Hour		Overhead		Metal Deposited		Cost
	Time hrs.	Rate per hr.	Labor cost	Pltg. time hrs.	Rate per hr.	Amount 48 c. per lb. 3 c. oz.	
1. Clean, rinse and place in tank	.1400 (8 2/3 min.)	\$.60	\$.0840				
2. Plating time*				3.125 (187 1/2 min.)	\$1.00	*9.6 oz. @3c. per oz.	\$.2880
3. Remove from tank, rinse & dry	.0500 (3 min.)	.60	.0300				
4. Unrack & place in box	.0666 (4 min.)	.40	.0266				
5. Color nickel plate (P. W. 95c. per 100)			1.9000				
Totals of costs			\$2.0406				\$.2880

\*25% increase to allow for minimum deposit and removal of deposit in nickel coloring.

1 hour, per sq. ft. by 8 amperes—0.0001224".

6. Amount of nickel deposited in 1 minute by 8 amperes—0.00512 oz.

Consolidating our costs for .0001" nickel deposit:

Per 200 pieces	
Labor Cost .....	\$1.7406
Overhead—100% on labor ..	1.7406
Machine hr. overhead .....	.3013
Metal Cost .....	.0288
<hr/>	
Total Cost .....	\$3.8113
Cost per 100 .....	\$1.9057

Consolidating our costs for .001" nickel deposit:

Per 200 pieces	
Labor Cost .....	\$2.0406
Overhead—100% on labor ..	2.0406
Machine hour overhead .....	3.1250
Metal Cost .....	.2880
<hr/>	
Total Cost .....	\$7.4942
Cost per 100 .....	\$3.7471

In the consolidated costs of .0001" and .001" nickel deposits (see Tables 1 and 2, page 422):

The labor cost is self-explanatory. Overhead (100% on labor) includes all chemicals, such as cleaners, acids, drag-out, repairs in the plating room, foreman's salary, electric power and water bills, etc.

Machine Hour Overhead includes rent on the floor space occupied by the tank, depreciation on the tank, auxiliary tank equipment and original value of the solution. (Most of the increase in cost occurs in this item in the case of the .001" thick deposit).

Considering the difference in the cost of plating a deposit of nickel .0001" compared to .001"

\$3.7471 cost of .001"  
1.9057 cost of .0001"

\$1.8414 difference in cost

Therefore:

1.8414

— x 100 = 96.62% — is the increase in plating cost of a .001" deposit over a .0001" deposit.

While this increase in cost at first may seem great, and most manufacturers might state they would lose money meeting a .001" thickness specification, let us see how this increase in plating cost compares to the entire cost of the article.

Cost of metal, foundry labor cost, all machining and polishing costs of

this article, up to plating, have per 100 pieces, amounted to \$12.00. This figure includes all direct labor and overhead charges of the departments through which the articles have been processed. Therefore:—

.0001" thickness deposit

Cost up to plating .... \$12.0000  
Cost of plating ..... 1.9057

Total cost ..... \$13.9057

.001" thickness deposit

Cost up to plating .... \$12.0000  
Cost of plating ..... 3.7471

Total cost ..... \$15.7471

The difference in the total cost of the article between an .001" nickel deposit and a .0001" deposit will then be:

\$15.7471—total cost of articles of .001" nickel deposit  
13.9057—total cost of articles of .0001" nickel deposit

\$ 1.8414

Therefore:

\$1.8414

— x 100 = 13.24% — the increase in total cost of the article considered.

Since most of the increase occurs in the overhead, this figure could be considerably decreased by the use of

plating equipment and methods that would greatly reduce the plating time required to obtain the .001" nickel deposit.

The various types of equipment and methods, including control of electrochemical factors, by which this decrease in plating time can be accomplished, will be the subject of a future article.

The cost figures of the .0001" nickel deposit of \$13.9057 and \$15.7471 are the factory costs to which have still to be added general administrative and sales costs.

The cost of any manufactured article consists of the sum of three principal cost items which are (1) factory cost, consisting of cost of material, direct labor and factory overhead, (2) general administrative cost, (3) sales cost.

Only after these three costs have been totalled is the percentage for profit added, which becomes the selling price.

It can readily be seen that the increase in cost by plating a .001" deposit instead of .0001" deposit, is a very small factor in the selling price.

Therefore, what might at first have appeared to the manufacturer as a money losing proposition, upon analysis, especially if competitors have to meet the same specification, turns out not to materially interfere with the making of a satisfactory profit. Competition being on an even basis, the manufacturer with the most efficient plant and methods would have the advantage.

## Rust Proofing Under the Finish



Fig. 1. Sample panel Bonderized before finishing, purposely scratched to the bare metal and exposed to weathering for six months. This photo shows that the finish has adhered and corrosion has not spread. (Courtesy Buick Motor Co., Flint, Mich.)

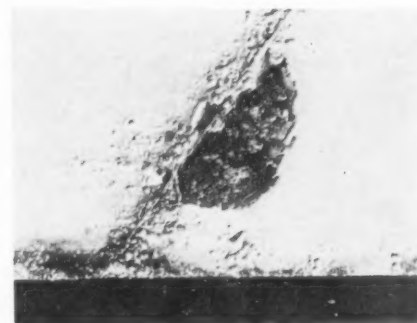


Fig. 2. Sample panel not Bonderized and coated like Figure 1 and exposed under the same conditions. Note that the finish has peeled off with the spread of corrosion from the scratch. (Courtesy Buick Motor Co., Flint, Mich.)

# Physical Properties and Uses of Heavy Nickel Deposits

## *Engineering or Mechanical Uses of Nickel Deposits*

The uses of heavy nickel deposits depend upon good physical properties combined with resistance to wear or corrosion or both. They fall into two categories:

(1) *Electroforming* may be defined as the manufacture or reproduction of articles by electrodeposition. Familiar examples of such products are electrotypes, phonograph record matrices and medals. "Electro-casting" perhaps conveys the idea better to metallurgists.

(2) *Building-up or surfacing* is distinguished from electro-forming by the fact that the deposit is made a part of the object upon which it is cast rather than removed from it for separate use.

## *Electrotyping*

Electrotyping is a method of reproducing printing plates. For the ordinary classes of work the electrotypes are made of copper, nickel being used only in the form of a thin coating on the printing surface to resist wear or corrosive inks. Heavy nickel deposits are used, however, at the Bureau of Printing and Engraving in Washington, where the plates used for printing currency are built up from hand engraved master plates by deposition of a layer of nickel about 0.01 inch thick, backed by a heavy iron deposit. A thin layer of chromium, not sufficient to cause any loss of detail in the engraved lines is put on the nickel printing face after the plate is removed from the master.

It is interesting to note how faithfully the surface of a master or mold can be reproduced by the nickel deposit. Blum and Hogaboom<sup>8</sup> state

<sup>8</sup> Abstracted from a paper presented before a joint meeting of the American Society for Metals and the American Electro-Platers' Society chapters at Hartford, Conn. on April 12, 1938. Part 1 was published in our August issue. This paper will appear in full in the August issue of the Monthly Review of the American Electro-Platers' Society.

Electrodeposition of heavy nickel layers is viewed as a cold casting process, capable of producing metallurgically sound nickel with excellent physical properties. The plating industry is already equipped to supply such a product for engineering uses and thus diversify and expand its business. Old and new engineering uses for thick nickel deposits are reviewed. Conclusion.\*

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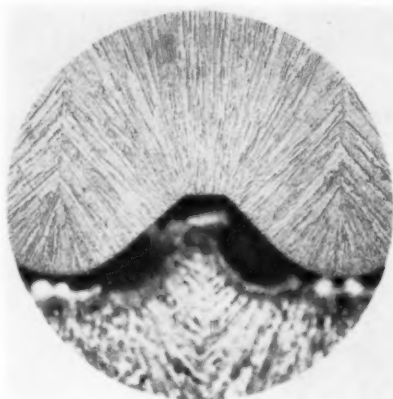


Fig. 8. Cross-section of sound groove in nickel master matrix.

that not only the finest engraver's marks 0.00002 inch wide, but also the faintest scratches visible under the microscope are exactly reproduced by the depositing nickel.

## *Phonograph Record Plates*

Reproduction of phonograph master and stamping plates is similar in principle to electrotyping. In both processes the object is to produce a sound, mechanically strong metal object whose surface exactly reproduces all the details of the original mold. Figure 8 shows a cross-section of one sound groove in a nickel master matrix used for making high fidelity phonograph records. When one considers that this metal is formed cold, with a grain structure so much finer than the contours of the record groove

\*Blum and Hogaboom, "Principles of Electroplating and Electroforming", N. Y. (1930) p. 156.

itself, it is easy to understand why better reproduction of the surface can be achieved by electrodeposition than by any other metal forming process.

## *Electroformed Sheet*

Electroformed copper tubes have been made commercially and electroformed copper sheet is available in this country in light gauges where the price of the rolled product is relatively high on a pound basis. A bi-metal sheet is being made electrolytically in England for the manufacture of kitchen utensils. Figure 9 is a photograph of a 7-inch sauce pan drawn from 0.031 inch sheet consisting of a layer of nickel, used on the inside of the utensils, and a layer of copper on the outside. This illustrates how high the metallurgical quality of electroformed sheet can be made without the benefit of forging or rolling treatments.



Fig. 9. 7-inch saucepan made from electroformed nickel-copper bimetal sheet. N. C. Joseph, Ltd.

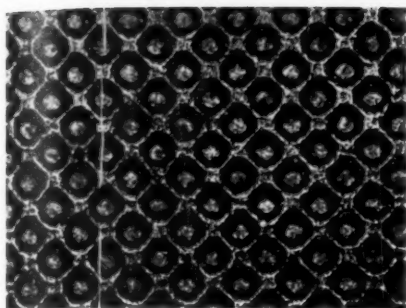


Fig. 10. Electroformed nickel screen 175 mesh; 0.005" thick. (C. O. Jelliff Mfg. Corp.)

AN outstanding new application of electroforming is involved in making screens by direct deposition of copper or nickel. There are at least two plants already in operation in this country which can build up any size of fine mesh screen or perforated sheet of almost any design which is capable of photographic reproduction. Thicknesses are suitable for decorative and for industrial use. The advantages of the process of making screens by electrodeposition are high accuracy in the size of opening, flexibility in choice of relative area of perforations and metal, enhanced corrosion resistance due to elimination of concentration cell action in the crevices between overlapping wires, and better resistance to wear and fatigue due to elimination of the wire knuckles.

Figure 10 is a photomicrograph of an electroformed nickel screen of 175 mesh.

Figure 11 shows a perforated nickel strip only 0.005 inch thick. Thin



Fig. 11. Electroformed nickel strip; 0.005 x 1 inch. (C. O. Jelliff Mfg. Corp.)

gauges of strip can be made cheaper by electroforming than by rolling because the cost and scrap losses incident to repeated rolling and annealing are eliminated. The perforations are "cast" in the metal rather than stamped out.

Figure 12 illustrates a radio dial with perforated numerals as it would look when illuminated from the rear. Figure 13 shows a similar dial for a clock.

## Building-Up and Surfacing

While it is often cheaper to scrap standard machine parts which have been worn or which were accidentally machined undersize, there are many cases involving more complicated, special or expensive parts where reclamation is economical. One machine plant in New England has a scrap pile containing hundreds of parts of automatic machines which cannot be used because a machinist's error of only a few mils rendered them unfit for use in precision or high speed

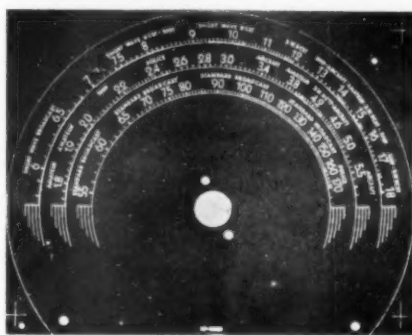


Fig. 12. Electroformed radio dial. (C. O. Jelliff Mfg. Corp.)

equipment. Some of these parts cost over a hundred dollars each.

The salvaging of worn and mismatched parts has been carried on by the Fescol Company in England for almost twenty years. They have two plants there and a new one in France. In the United States some work has been done with electrodeposited iron at the Westinghouse plant in East Pittsburgh but more general interest has been aroused only recently.

British experience has been that old machine parts can be repaired cheaply and often give longer life than a new

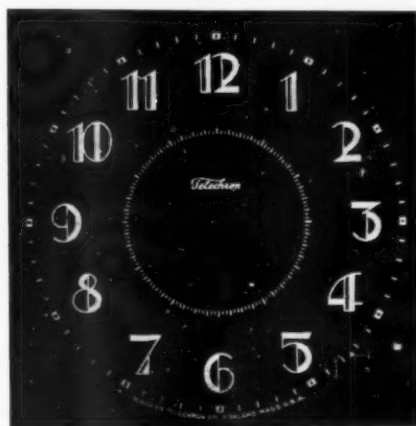


Fig. 13. Electroformed clock dial

Table VI

PARTS COATED WITH HEAVY NICKEL DEPOSITS

1. TO IMPROVE NEW PARTS
2. TO SALVAGE MISMATCHED PARTS
3. TO SALVAGE WORN PARTS

ARMATURE SHAFTS  
COMPRESSOR RODS  
PUMP SHAFTS  
PUMP SLEEVES  
PUMP RODS  
PUMP PLUNGERS  
TEXTILE SPINDLES  
GLASS LEHR ROLLS

HYDRAULIC RAMS  
VALVE STEMS  
WRIST PINS  
LATHE BETS  
LATHE SADDLES  
SPINDLE SHAFTS  
LITHOGRAPH ROLLS  
PAPER MILL ROLLS

ELECTRIC MOTOR END FRAMES (MISMATCHED)  
CAMS FOR VISCOSE MFG. MACHINERY  
DIESEL CRANKSHAFT PIN BEARINGS  
EXPANSION SLEEVES (SUPERHEATED STEAM)  
PISTON ROD BEARINGS  
TEXTILE PRINTING ROLLS  
TURBINE GEAR SHAFTS

part due to improved wear resistance. It should be noted again that even where the wearing surface must be of chromium, the English Co. prefers to build up thick layers more rapidly with nickel to provide a tough supporting layer for the final thinner chromium coat.

A list of parts to which heavy plating has been applied for salvaging after wear or correcting machining errors is given in Table VI. Profitable use of nickel coatings on new parts has been made for many of the applications shown.

In the power field especially, savings have been made restoring worn parts from service in superheated steam. The temperature coefficient of nickel is so close to that

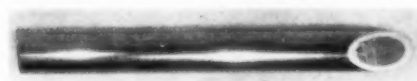


Fig. 14. Heavy soft nickel deposit on steel rod:  $\frac{1}{8}$  inch thick

of steel that no difficulty has been experienced similar to that sometimes caused by the large difference in co-

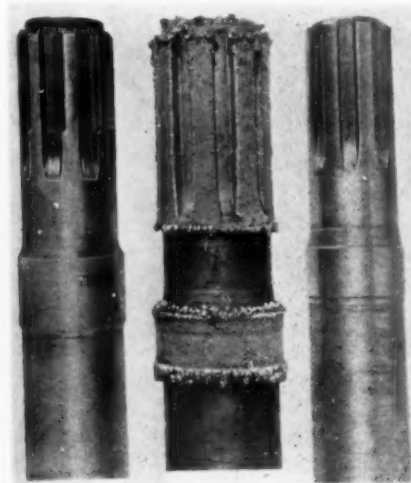


Fig. 15. Repair of worn spline shafts. (Fescol, Ltd.)



Fig. 16. Fescolized steel tube roll for paper mill

efficient of chromium as compared with that of steel. The values for temperature coefficient of expansion in the range 25—100° Centigrade are: nickel 0.0000133, steel 0.0000118 and chromium 0.0000082. This advantage, together with the good resistance of nickel to corrosion and oxidation

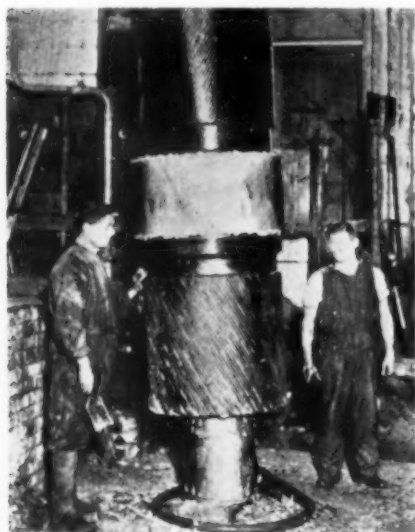


Fig. 17. Turbine gear shaft repaired by Fescolizing

at moderately elevated temperatures accounts for the success of nickel-coated steel for use as glass lehr rolls. Worn armature shafts have been

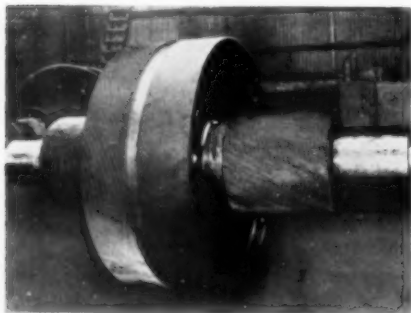


Fig. 18. Turbine gear after repair



Fig. 19. Hydraulic cylinder. (Fescol, Ltd.)

repaired without removal of the windings. A large user of refrigeration compressors has found that by building up worn compressor rods, only one size of rods and gland packings need be kept in stock, instead of turning down rods and using smaller packings. The nickel-coated rods last

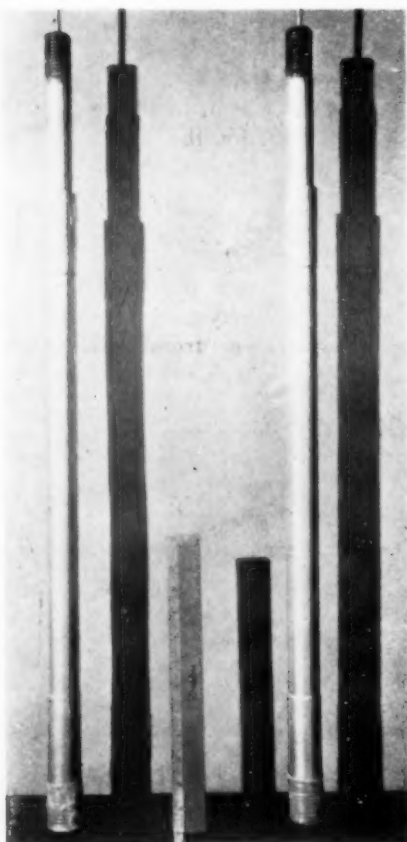


Fig. 20. Reflux pump rods



Fig. 21. Chemical pump plunger

longer and the packings last longer on such rods.

Some of the applications in Table VI depend upon a combined resistance to wear and corrosion of the coating. Such are the pump parts (when the fluid to be pumped is corrosive), the cams for viscose machinery which are called upon to resist wear while operating completely submerged in corrosive solutions, and paper mill rolls and

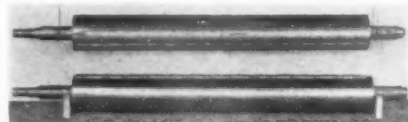


Fig. 22. Printing press cooling rolls. (Chromium Corp. of America.)

printing rolls (if the inks are corrosive).

#### Acknowledgement

The measurements quoted and the plated parts illustrated in this paper, except those specifically credited to others, were made by E. J. Roehl and J. W. Carey of the International Nickel Company Research Laboratory. Their assistance is gratefully acknowledged.

#### Precious Metal Leaf

Palladium, a precious metal of the platinum family, is used in leaf form for the decoration of four large glass mural panels in the grand salon of the French liner "Normandie," the palladium leaf being used in combination with platinum, gold and silver leaf.

# Methods of Joining Copper Alloy Products. Part 8: Sheets

## Bronze Welding

This application is so named because the procedure more nearly resembles fusion welding than it does soldering or brazing. In bronze welding, the type of joint illustrated in Figure 14(c), (d) or (e), i.e. the open vee, is generally used while, as was pointed out above, in brazing or silver soldering overlapped or scarfed surfaces are the rule.

However, the beta brasses or yellow welding bronzes, such as Tobin and Manganese, given in the last group of Table 3 will penetrate to a certain extent between closely overlapping surfaces of a copper alloy or steel and full advantage should be taken of this property.

Generally speaking the oxy-acetylene blowpipe is the source of heat invariably used for bronze welding. As was pointed out in the discussion on the effect of alloying elements, zinc in the 60:40 copper-zinc alloy boils at 1958°F. Hence, the high temperature inner white cone of the oxy-acetylene torch should not be allowed to touch the molten bronze, nor should the bronze be heated appreciably above its melting point. Bronze welding should proceed as rapidly as possible, once the base metal arrives at the proper "tinning" temperature, with continuous melting of the welding rod.

The bronze is usually melted in the neutral torch flame though when it is used as a fusion welding rod for some of the rolled brasses and extruded bronzes, a strongly oxidizing flame yields stronger and sounder welds than does the neutral flame.

Bronze welding of copper sheets in making piping and apparatus for the paper mills, bronze welding of copper plumbing and drainage pipes and for a vast variety of combinations of the copper and nickel alloys makes

Welding methods have become vitally necessary (a) as an element in facilitating design, (b) as an economical manufacturing method, (c) as an aid to good service performance and (d) as a convenient means of making repairs. Examples are taken and analyzed to help the designer, shop superintendent and welding operator to a better understanding of the problems involved.\*

By I. T. HOOK

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this process one of the most versatile in the welding industry. A great deal of bronze welding is also applied to cast iron, galvanized iron and steel but such applications are beyond the scope of this article.

## Fusion Welding of Copper Alloy Sheets

Fusion welding of the copper alloys was unknown twenty years ago. Now, there is a fusion welding process for at least the eighteen sheet alloys given in Table 6. Not all of them, however, are weldable by the same process. Thus brass can not, in general, be fusion welded by the metallic arc but is readily welded by the oxy-acetylene torch while beryllium copper is weldable by the carbon arc but can not be welded by the oxy-acetylene torch.

As will be seen from Table 6, copper alloy sheets have melting points varying between the 1661°F (905°C) of Muntz metal to the 2237°F (1225°C) for Super Nickel. This means, in general, that any gas other than the oxygen-acetylene combination would be too slow for fusion welding. However, these temperatures are easily reached by (a) the oxy-acetylene blowpipe, (b) the electric arc—metallic or carbon electrodes and (c) resistance welding.

The usual requirements in a copper alloy weld are (1) strength, soundness and ductility, (2) comparable corrosion resistance, welded seam to sheet and (3) color match, weld metal to sheet. The latter is more important

for architectural uses than for engineering equipment.

The different copper alloy sheets respond very differently to the methods of welding. Similarly the copper alloy welding rods of Table 7 measure up to the requirements stated above with a great variety of results. Hence, each sheet alloy, or in some cases groups of alloys, must be given separate consideration both as to the method of welding and as to the appropriate welding rod.

While exact procedures can not be given in the absence of specific details, general directions are given below. Difficulties likely to be encountered are given more emphasis than those properties of the copper alloys which lend themselves readily to the welding operations. Thus an operator, noting herein the obstacles he must overcome, can, with the skill that is his stock in trade, make satisfactory welds in any and all of the copper alloys.

Taking up in proper order the copper alloy sheets given in Table 6, we submit the following notes on the procedures for welding same:—

*Electrolytic copper, tough pitch copper, arsenical copper, Lake copper, oxygen-bearing copper, electrical copper:*—This copper is distinguished by its high electrical and thermal conductivity. In welding large sheets, a very high heat input is necessary to overcome the heat escaping to the surrounding metal. Small pieces of copper in which the heat loss by conduc-

\*Parts 1, 2, 3, 4, 5, 6 and 7 were published in our issues for Sept., Oct., Nov., 1937, Jan., April, June and August, 1938.—Ed.

tion is small as for instance copper welding rod offer no difficulty from this source. Like all pure metals, copper melts suddenly at its melting temperature to an almost, water-thin liquid and freezes as quickly when the metal is cooled.

Once raised to its melting point, copper flows freely and smoothly. The reason it is given no higher weldability rating than "C" for the oxy-acetylene and arc methods and "D" for resistance methods is due (a) to its high thermal conductivity and (b) to the oxygen content which may cause weak welds as noted in the foregoing under "effect of alloying elements."

To overcome the high thermal conductivity, larger capacity oxy-acetylene blowpipes or hotter arcs must be used than is the case in the welding of steel for example. Thus, for welding  $\frac{1}{8}$ " thick copper sheet, a torch burning 12.4 cubic feet of acetylene per hour will be found desirable. For welding  $\frac{1}{4}$ " copper two torches, one for preheating a few inches ahead of the welding torch and the other welding, both of 26.5 cubic feet acetylene per hour capacity, will be needed. For still thicker metal both torches may be used for welding one following the other at a distance of 4" to 6" or both welding vertically upwards from opposite sides. Blowpipes consuming about 35 cubic feet of acetylene per hour have been found desirable for welding  $\frac{1}{2}$ " thick copper.

For arc welding, high heats corresponding to 600 amperes or more are used for the thicker copper sheets. Since the metallic arc electrode to carry such high currents would be larger than is needed for filler rod, the carbon arc rather than the metallic arc is normally used for welding copper sheets greater than about  $\frac{3}{32}$ " in thickness.

Also, in order to increase and spread the arc heat, higher-than-normal arc voltages are used with some welding rods—notably the Phosphor Bronze "D" of Table 7—Voltages across the arc of 35 to 60, corresponding to arc lengths of  $\frac{1}{2}$  to  $1\frac{1}{2}$ ", are not uncommon in the "long carbon arc" welding of copper.

The weakness arising from the oxygen content is overcome insofar as this is possible first by hot working the welds after the seam is complete. This method in general can only be applied to oxy-acetylene welds. The

seam is reheated to a dull red temperature and hot forged, the hammering being continued until the temperature falls to a black heat. Arc welds made by the use of phosphor bronze "D" welding rod can not be hot forged on account of the hot shortness of the phosphor bronze weld metal.

The second method of overcoming the oxygen weakness is applicable only to carbon arc welds. In this case, the weld is run at a sufficient speed—ten or more inches per minute—to forestall the coalescence of the cuprous oxide with its embrittling effect.

For oxy-acetylene welding of the electrolytic copper, the deoxidized copper or the silicon copper welding rod of Table 7 is most commonly used. For carbon arc welding, the Everdur is most frequently used with the short arc, 22 to 27 volts, or Phosphor bronze "D" with the long arc, 35 to 55 volts.



Figure 22. Open tank made of  $\frac{1}{4}$ " thick hot rolled electrolytic copper—long arc welded. (Courtesy Struthers-Wells Co.)

The open tank of Figure 22 was welded using  $\frac{1}{4}$ " Phosphor bronze "D" welding rod with a 450 ampere 52 volt carbon arc. In order to avoid difficulties in backing up such long seams, the copper sheet was beveled on a 35° angle to within  $\frac{1}{32}$ " of the bottom, closely abutted, tacked on the back and welded without the use of a backer as above in the 70° vee. The seam was then chipped out on the back and finished with another bead similar to the first. Vats of this character find many uses in the chemical industry.

Electrolytic copper welding rod is sometimes used in oxy-acetylene welds having low requirements for strength

and ductility. It is not recommended for important welds.

In resistance spot and seam welding of electrolytic copper sheet, difficulties arise from the low electrical resistance and the high thermal conductivity, both of which properties call for high current values to develop sufficient heat in the spot. The difficulty of maintaining the electrodes in good condition with such high current values makes the process too expensive to be commercial in most cases.

Tin coating, solder-coating or nickel plating the surfaces to be spot welded increases the resistance sufficiently to make the process feasible in some instances. In most cases, however, it will be found desirable to use some other copper alloy with a higher resistance weldability for fabrication by resistance spot and seam welding in place of electrolytic copper itself.

Copper rods in the smaller sizes and wires are resistance butt welded without difficulty. The action, however, is quite different from that used in steel resistance welding. Copper requires heavier currents and lighter, faster push-up pressures in order to catch the faces at the welding point which is coincident with the fusing of the metal.

### Deoxidized Copper

It will be noted in Table 6 that deoxidized copper is given a higher rating in its weldability in both the oxy-acetylene and the arc processes than the electrolytic copper. This is because it is not subject to the weaknesses arising from a content of cuprous oxide as is the case with the latter. Deoxidized copper has no oxygen to cause weakness in the welding operation and the small amount of deoxidizer, usually phosphorus, left in the metal offers no handicap to the welding operations. Deoxidized copper, therefore, is recommended for apparatus in which the strength of the welded seams is an important consideration.

While the thermal conductivity is slightly lower than that of the electrolytic copper, it is still high enough to call for a high heat input for welding. The remarks applying to electrolytic copper concerning the oxy-acetylene and arc heat requirements apply equally well to deoxidized copper. The same is true of the welding

rods and the remarks on resistance spot, seam and butt welding.

### Commercial Bronze and Red Brass 85

These alloys carrying 5, 10 and 15% zinc in solid solution in copper respond in much the same manner to welding operations as does deoxidized copper and are, therefore, given the same weldability rating.

They all have comparatively high thermal and electrical conductivities and are as a consequence difficult to join by resistance spot welding methods. A thin, solder or nickel plate would improve the surfaces for resistance spot or seam welding but high heat values, short current-on periods and accurate pressure conditions are necessary.

The optimum welding method is by the oxy-acetylene torch and a yellow bronze welding rod such as Tobin Bronze. A good brazing flux on base metal and rod is essential to the securing of easy flowing of the metal.

If difficulty is experienced with unsound weld metal, a strongly oxidizing flame should be used. To obtain the correct torch setting, bring the flame to a neutral then throttle the acetylene until the oxygen has about a 30% excess. With this torch adjustment, all vaporization of the zinc should cease.

One might ask why not use a deoxidized copper welding rod which has characteristics and color much like the commercial bronzes. The reasons why we do not recommend such a combination is that the filler metal would (a) be weaker than the base metal and (b) it would also have a higher melting point. Both of these points are important. Wherever possible the filler metal should be stronger than the base metal and for oxy-acetylene welding melt at least a few degrees lower than the base metal.

These metals may also be welded by the carbon arc, if it is permissible to use a non-zinc alloy such as phosphor bronze or "Everdur Silicon Bronze" as a filler metal. In this case, the arc plays between the carbon electrode and the filler metal as illustrated in Figure 23. It must not be allowed to play on the base metal as the intense heat would cause the zinc to boil out of the alloy. For the same

reason, the metallic arc is not recommended as a welding method for joining any of the zinc alloys.

The phosphor bronze "D" and the "Everdur Silicon Bronze" welding rod both yield welds having a fair color match to red brass 85 sheet and commercial bronze sheet. If an exact color match is required, strips of the base metal may be used as filler rod. It will be necessary in this case to use the oxy-acetylene torch and not the carbon arc. A flame having an excess of oxygen as described will, by suppressing loss of zinc, yield welds having an exact color match.

### Red Brass 80, Spring Brass, Yellow Brass, Muntz Metal

These bronzes having zinc proportions from 20% to 40% in copper include a great variety of properties. Sheets of same have an endless variety of uses. As will be noted in Table 6, the thermal and electrical conductivities are lower than those of copper or commercial bronze but still rather high—three times those of the usual steel sheet for example.

However, the bronzes are readily

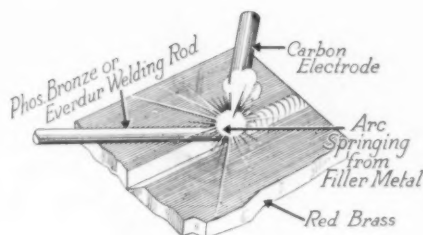


Figure 23. Carbon arc welding of red brass

resistance spot and seam welded being given a "C" or "B" weldability rating in this process. The red brass 80, having only 20% zinc requires a rather high value of electrical energy to develop the welding heat and is, therefore, not rated as high as the common bronzes which are resistance welded with greater facility. The 40% zinc alloy, Muntz metal, is not rated as high in resistance weldability as the common bronzes on account of the tendency for the electrodes to pick up metal from the surface of the sheet. Some experimental work published recently\* indicates that, with a sufficiently heavy pressure, this tendency

\*Spot Welding . . . of Copper Base Alloys. D. K. Crampton and J. J. Vreeland. Journal American Welding Society. V. 16 No. 10 (Oct. 1937) Page 9 to 18.

to "pick-up" may be avoided, in which case Muntz metal may be rated higher.

Thus, with correct pressure and a sufficient heat, brass is resistance spot and seam welded in the manufacture of a great variety of products.

On the other hand, when pressure tight containers manufactured by resistance seam welds are to be made, a sheet having an "A" resistance weldability rating should be used.

As in the welding of red brass 85 and commercial bronze, Muntz metal, common brass, spring brass and red brass 80 are readily welded by the oxy-acetylene torch and Tobin Bronze welding rod. Since the melting point of the filler metal is appreciably lower than that of the last three bronzes named, the weld proceeds rapidly with the usual bronze welding procedure. In bronze welding Muntz metal a slightly different condition obtains—the base metal *must be fused* along with the welding rod. In the case of the lower zinc alloys, the base metal need not be fused though it is heated to a good "tinning" temperature.

When the maximum in soundness is required, a strongly oxidizing flame should be used. This is a slower flame than that with a neutral adjustment and for this reason is not used in the bronze welding of brass except for the requirement as stated. Tobin bronze will give a good color match to Muntz metal and common brass. To meet more exacting requirements on this score, strips of the base metal may be used.

Common brass, etc. may be carbon arc welded with a zinc free welding rod as illustrated in Figure 23 for red brass. It is difficult to avoid a good deal of zinc vaporization which is prone to cause some porosity at the junction of fused and unfused metal. However, welds of reasonable strength and soundness can be made.

The color match, where phosphor bronze or Everdur is used as the welding rod, is not as close as it is when these rods are used on red brass or commercial bronze.

*This article will be concluded in an early issue.—Ed.*

### Tonnage of Plated Metal

It is estimated that one million tons of steel are nickel plated each year in the United States and Canada.

# Getting the Most Out of Your Lacquer

A discussion of the practical aspects of thinners, viscosity, settling of pigments, temperatures and spraying equipment.

By W. T. SMITH

*Roxalin Flexible Lacquer Co., Elizabeth, N. J.*

**T**HE almost universal practice in purchasing lacquer products for metal finishing seems to be in specifying a consistency subject to a reduction for actual application. While the reduction factor will vary somewhat, the prevailing ratio is probably one hundred percent; that is equal volumes of the finishing material and thinner.

## ***Buying Lacquer With or Without Thinner***

In the case of pigmented materials, the reason is obvious. Thin material has a low viscosity and the vehicle will not provide permanent suspension of the inert ingredients. In the case of clear materials, however, this practice is much less logical. It matters little in the final result who adds the thinner necessary to reduce the non-volatile constituents to a working consistency. The frequently cited point of economy in thinning the materials before use has little to justify it. One might purchase an automobile less tires with a view to substituting a less expensive brand, but the economy of the plan is questionable in view of the vast tire purchasing power of the car manufacturer as against the buyer's own retail opportunities plus the labor of mounting them. Due to additional handling, packaging, etc. the purchase of thinner as a separate item is always more expensive than the same solvents as an integral part of a lacquer.

## ***The Control of Viscosity***

To return for a moment to the thinning question. Regardless of the thinning policy, it is always necessary to have a certain amount on hand for routine or emergency reduction. A cheap thinner is *never* an economy. When tempted to purchase a sixty or seventy cent thinner, secure a copy of

a market journal showing current prices of solvents. Remember that hydrocarbons (naphthas, solvent naphthas, toluol, xylol, etc.) are not lacquer solvents, but diluents the use of which the manufacturer of the lacquer has not overlooked or neglected, and that alcohols are but partial solvents for the average lacquer product. Consider, therefore, that a thinner should contain, usually thirty percent of active ester solvents and note the current prices of these. Consider the mixing, handling and packaging costs to the vendor of a thinner. It will at once be apparent that adequate solvency for dispersion, control of viscosity, blush retarding, flow, drying and adhesion cannot be the major properties of such a thinner. Remember that while a cheap lacquer may be improved by a good thinner, a good lacquer may be damaged almost equally by a cheap thinner. The conventional claim that "it all evaporates and is lost anyway" is a fallacy. So, for that matter does the coal or fuel oil that you use to heat your home. But the cheapest fuel obtainable may not always enable your new, and expensive heating system to perform properly. True, a rich lacquer may often accept a relatively lower priced thinner used as an economy measure, but it should be used only on the advice of the lacquer manufacturer, who knows what it will stand. It is a fact that the toughness and film strength of a lacquer coating may be influenced directly by the type of solvents used, despite the impression that they have done their work, evaporated and gone forever.

Viscosity is a property of lacquers which is not as generally understood by users of such materials as it might

be. While both the viscosity and the total solids (or non-volatiles) of a lacquer have a direct bearing on its film building property, neither factor is entirely significant in itself and independent of the other. Viscosity, that property whose mention brings so often a vague look to the face of the foreman finisher, is perhaps, from the application standpoint, the more significant factor of the two. It is quite possible to alter a lacquer which has been rejected as having, "no body", to an entirely satisfactory material by raising the viscosity slightly and leaving the actual solids practically unchanged.

Viscosity is a property of nitrocellulose which is given to it by a special processing and need not be directly related to the actual solids content of the lacquer. While viscosity will increase directly with an increase in solids effected by addition of the same cotton, use of a different viscosity cotton will change the situation completely. It is entirely possible to produce a clear lacquer which will spray readily at thirty percent solids or one of less than five percent which would not run out of an inverted vessel. The significance of this property, which may be best described as "stiffness", is that all else being equal, a more viscous material has more "hang" permitting the application of a heavier film before encountering the hazard of sagging or heavy edges. The extreme in this direction is represented by a condition wherein the film does not flow out smoothly or has a tendency to form bubbles or pinholes.

Production conditions and requirements are usually the guide to the most efficient viscosity. Quick covering, smooth flow and a definite time

factor in application to intricate surfaces indicate a low viscosity material. Higher viscosities may prove advantageous in the case of coating relatively plain surfaces where bridging is not a hazard, and where the time factor and adequate equipment permit careful application and thorough atomization.

### **Settling of Pigments**

Due to the tendency of all heavily pigmented materials to settle somewhat in storage, consideration must be given to the agitation problem. In general, the larger the storage vessel, the greater the difficulty of re-dispersing the material to a degree suitable for use. The actual amount of labor necessary to mix a fifty gallon container of heavy enamel to a point where the ingredients are all fully dispersed and uniformly suspended may not be suspected even by one who believes that he has done a great deal of it. The fact remains that, working with the conventional hand agitator as supplied in the drum, if he has devoted less than from a half hour to an hour to a very vigorous stirring, the enamel is very likely to be withdrawn in a non-homogenous state. A commendable practice used by some drum buyers, is to store the drums on their sides and to roll them a little—just sufficiently to move them a quarter way around—every day, thus preventing the settling ingredients to form a heavy deposit in any one portion of the drum. While this practice will not prevent settling, it will be found a great aid to a ready re-dispersion. It is always good practice to purchase heavily pigmented enamels in five gallon cans. When opened, the top may be cut out and the contents attacked with a large “two hand” paddle with good effect. Such packages are usually stored upsidedown, and lend themselves readily to a systematic shifting of position to distribute settling as described above.

### **Temperatures for Storage and Application**

The temperature of storage space for lacquer products is of considerable importance, though not within particularly narrow limits. It is probably safe to say that the efficient working temperature of most lacquers under average conditions is between 70° and 80° F. The viscosity factor, dis-

cussed above, is quite sensitive to temperatures. A material brought in from storage and used at a temperature of, say, 60° or 65° may be carrying a sufficiently increased viscosity to cause pinholing, orange peel and retarded production due to slow flow, and which at 75° might be a very satisfactory working material. The temporary warming of lacquer products for application does no harm, and is a practice of which more may be heard within the next year or so. However, storage in a consistently warm place will inevitably result in some harm, such as a drop in viscosity or a partial solution of some of the inert ingredients.

Aside from storage conditions, the temperature of the room where applications are performed should be kept as nearly as possible within the limits mentioned above for the temperatures of the material. Application to cold work in a cold room will have an inevitable effect on flow and coverage and may affect adhesion or induce blushing by an abnormal condensation. On the other hand a too warm room will affect the drying time very materially. Very high temperatures, such as those often encountered in hot weather as well as cross drafts or any excessive movement of air will accelerate the evaporation of the wet, fresh coating to a point sufficient to cause orange peel from the shortened flow period and overspray from too rapid surface drying.

Solvent blushing, which is now much better understood and controlled than a few years ago, occurs when the relative humidity of the atmosphere is sufficiently high to allow a condensation of free water in the area cooled by the evaporation of the solvents. The free water precipitates the nitrocellulose and a “blush” is the result. The ideal relative humidity for lacquer coating is probably not over fifty to fifty five. While it is an interesting point that the blushing can be controlled by increasing the temperature, the heat does not “dry up the moisture” as is often believed. The increase in temperature increases the capacity of the atmosphere for water so that the *relative* amount it contains is lower, even though the *absolute* amount (represented by the less understood, absolute humidity) may remain the same. Picture a gallon of water in a pail. If one stepped into the pail, it would

be quite sufficient to wet his foot thoroughly. The same gallon of water in a tank ten feet in diameter would not greatly inconvenience anyone who wanted to walk across it.

### **Provide Adequate Air and Equipment**

Give your lacquer a fair chance to do its best work by insuring the use of adequate air and equipment. The average modern production spray gun is made to operate at not less than fifty pounds pressure, and on capacities varying from five to eight or nine feet per minute. This means that with all equipment in operation, the pressure should not drop below the required working point. Pressure, moreover, is usually incidental to the more important factor of sustained supply. So much has been written on the matter of clean air, free from oil or free moisture, that it will not be discussed here.

The method of feeding material to the spray guns is divided into four general groups, which will have considerable bearing on production times and the general quality of the work when balanced against the viscosity and character of the material being sprayed. The siphon feed is not always best adapted to the most efficient production work. A measure of the air must be utilized in lifting the fluid to the nozzle. Gravity feed is very widely used, and is not only entirely satisfactory, but perhaps the most economical from the equipment cost standpoint. Pressure feed has proven its worth many times for speedy, efficient production. It is divided into three types; the individual pressure tank, the central system and the application of pressure to the drum. By all means adapt working viscosities to the available air pressure, the atomizing equipment and the type of feed.

### **The Major Causes of Trouble**

Finally, it may be noteworthy that this writer's experience in trouble shooting on a great deal of metal finishing has indicated that ninety percent of trouble with organic finishes may be traced to two factors: (1) the cleaning and preparation of the surface to be finished, and (2) the proper agitation and reduction of the finishing material.

## Hughes Flight Illustrates Copper-Lead Bearing Improving

The use of copper-lead bearings for many of the vital parts in the engines and propeller mountings of the Hughes round-the-world plane dramatically brings to light the tremendous improvements which have been made in this type of bearing during the past two years, according to Emerson Frantz, Sales Manager of the Bohn Aluminum and Brass Corporation, Detroit, Mich. Early objections to the copper-lead bearings which were particularly concerned with increased shaft wear have now been overcome to such an extent that they can be used to advantage under extreme conditions of load and sustained operations without employing extremely hard shafts.

"The copper-lead bearing of today is a vastly improved product," says Frantz. "Tremendous strides have been made in the control of the structure of the bearing material with the result that not only is shaft cutting eliminated but also improvements in resistance to fatty acids have been effected. Better control of the alloy structure permits a maximum mixing of the copper and lead and consequently no exposure of lead areas to the shaft. In the earlier copper-lead bearings it was impossible even by visual inspection without magnification to locate large lead areas on the surface. With the up-to-date bearings even with a 40-power magnification these areas are not apparent.

"In tests conducted in the Bohn and other laboratories copper-lead bearings have been submitted to continuous running for the equivalent of 10,000 miles under full load. To make this more graphic the test would correspond to approximately 10,000 miles at a speed of 90 miles per hour with a passenger car engine.

"Road experience has shown that in many instances there have been even less shaft wear with the copper-lead bearings than with the babbitt due to the fact that the babbitt metal acts as a sponge in collecting gritty particles from the oil stream, retaining them with a subsequent abrasive action on the rotating shaft. Copper-lead on the contrary does not exhibit this tendency but will generally permit particles to float along in the oil stream and be returned to the oil cleaner where they are picked up and taken out of circulation.

"Because of the much higher load capacity of copper-lead as compared with babbitt, there is a decided drift



*The Hughes "round-the-world" plane used copper-lead bearings*

## Correct Anode Corrosion

In our July issue on pages 325-326 appeared an abstract of a paper entitled, "Importance of Correct Anode Corrosion in Nickel Plating" by W. Pinner and E. Borchardt. Several unfortunate typographical errors appeared in this abstract which we are glad to correct.

The following is the data, correct in every detail.

"In the paper presented last year the discussion concerned the preparation of the work by cleaning, the composition of the bath, anode corrosion and general plating conditions. In this paper the character of the corrosion of cast nickel anodes was discussed and illustrated with several slides. The object of all nickel platers is to obtain smooth deposits that are free from all roughness. If any rough spots exist they are either chipped off or torn loose from spots which are magnified by subsequent chromium plating. It is recommended that anodes be bagged. This is an admission of poor anode corrosion. In low pH solutions the life of a bag is short. Carbon content anodes were developed so that the anode would have a bag of its own. The carbon bag is effective in holding at the anodes loose nickel particles formed as long as these particles

toward copper-lead bearings particularly for high output engines. On heavy duty Diesel engines some records for main bearing life have been established which are far beyond experience with any other bearing material of present record. The selection of copper-lead bearings, for example, for such important points as the cam hub, supercharger impeller shaft, main propeller shaft and other bearings in the engines for Hughes round-the-world plane demonstrates the dependability of this modern development."

are not present in excessive amounts. A method of determining the percentage of loose nickel particles was described and it was stated that if these occurred in excess of .04%, the carbon bag failed to hold them and rough deposits resulted. The usual amounts of loose nickel particles ordinarily found in the anodes in use by the authors was stated to be from .001% to .005%. Anodes containing as little as .0005% nickel particles have been had.

"The methods of making anodes is in the hands of the manufacturers as the plater is concerned only after the anode is in the solution. Several photographs were shown of anodes having sand and slag inclusions, blow holes, pipes, non-uniform crystal structure and places where non-metals were released.

"It is admitted that good anode corrosion depends upon the condition of the solution. A poor plating bath will not corrode an anode properly. A chart giving the effect of different amounts of nickel chloride in a plating solution was shown to indicate the effect of the chloride upon a cast nickel anode. The plea was made for a better nickel anode."

# Shop Problems CASTING • METALLURGICAL FABRICATION • ASSEMBLING • • PLATING • FINISHING

Questions from readers relating to shop practice and answers by our associate editors

## Nickel for Die Castings

Q.—I would like to know if you could give me any information about my white metal die casting nickel solution. It comes out black and streaked. I strike it in copper and still it comes out black; also strike it in brass and comes out black.

Here is my formula: single nickel salts 10 ozs.; sodium sulphate crystals 16 ozs.; ammonium chloride 2 ozs.; boric acid 2 ozs. Run at 2-4 volts.

A.—The analysis of your solution shows:

Nickel .....	2.08 oz./gal.
Ammonium chloride .....	.36 oz./gal.
pH .....	6.4

Before recommending any corrections to this solution we advise that you remove the zinc contamination which is the source of the streaking.

The zinc can be removed by electrolyzing the solution using dummy cathodes, for several hours, preferably overnight. If the pH of the solution is brought down by adding sulphuric acid the zinc will be plated out with a minimum plating out of nickel.

Zinc can also be removed by treating the solution with ferrous sulphate and hydrogen peroxide and removing the resulting sludge by filtering.

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If the volume of solution is not considerable it would be easier and quicker to remove part of the solution and reduce the zinc content by dilution or if the zinc content is too high a new solution should be made.

After removing the zinc send in sample for checking.—G. B. H., Jr., Problem 5,677.

## Peeling Nickel

Q.—We are sending under separate cover one four ounce bottle of nickel solution for analysis. This solution was converted from double salt solution to the present state by the use of single nickel salts, boric acid and ammonium chloride as additional agents. We have one type of job which is made of one piece which leaves a pocket between the sides. This pocket catches the cleansing solutions, cyanide dips, etc. The chrome has stuck perfectly until the last lot which peeled pretty badly.

A.—The analysis of this solution is as follows:

Metallic nickel .....	3.0 oz./gal.
Chloride as ammonium chloride .....	2.1 oz./gal.
pH .....	6.8 plus

The pH of this nickel is too high and the chloride is slightly low. We would suggest the addition of 1 oz./gal. each of ammonium chloride and boric acid. To correct the pH add 12 fl. oz. of sulfuric acid to each 100 gallons of plating solution.

## Use this Blank for Solution Analysis Information

Fill in all items if possible.

Date .....

Name ..... Class of work being plated: .....  
Address ..... City ..... State ..... Volume used: .....  
Employed by: ..... Solution depth: .....  
Kind of solution: ..... Cathode surface, sq. ft.: .....  
Tank length: ..... width: ..... Kind of anodes: .....  
Anode surface, sq. ft.: ..... Distance from cathode ..... Original formula of solution: .....  
REMARKS: Describe trouble completely. Give cleaning methods employed. Send small sample of work showing defect if possible.

Use separate sheet if necessary.

NOTE: Before taking sample of solution, bring it to proper operating level with water; stir thoroughly; take sample in 2 or 3 oz. clean bottle; label bottle with name of solution and name of sender. PACK IT PROPERLY and mail to METAL INDUSTRY, 116 John Street, New York City.

Due to the pocketing of solution you may be getting a film on the work which is preventing adherence of the deposit. For instance if the alkaline cleaner is not removed it will precipitate basic salts when placed into the nickel tank. If cyanide is carried into the nickel a precipitate of nickel cyanide will form. Also if the cleaner contains soap, the acid in the nickel solution may precipitate the insoluble fatty acid. We would advise investigating the racking possibilities in order to eliminate the pockets.

—G. B. H., Jr., Problem 5,678.

### pH of Silver Solutions

Q.—To determine the pH scale of alkalinity as well as acidity, what would be the pH value of silver chloride plating solution?

A.—A silver plating solution with a pH value of 10.5 will give satisfactory results. The limits which are to be adhered to can be worked out by experience. *G. B. Hogaboom* in his paper on pH values states that a range of 10.3 to 10.7 produced the best silver deposits.

In determining pH values of either acid or alkaline plating solutions, the use of the glass electrode pH meter or indicator is very accurate and well suited for general use.—T. H. C., Problem 5,679.

### Refining Zinc Dross

Q.—As a by-product of our galvanizing operations we produce about 1000 to 1200 lbs. of dross per day containing approximately 94% zinc, 5% iron and 1% other minerals. Rather than sell this to a refinery, we are interested in refining the dross and recovering the zinc from it ourselves. We are wondering if you can recommend any method of refining this or if you know of any particular type of melting furnace which is used for this purpose in a capacity small enough meeting our needs.

A.—There is no simple practical way of refining dross. As you know the refining process is one of distillation, and that is a smelter size job. Your best method as a galvanizer is to read the article in *METAL INDUSTRY*, June, 1937, "The Treatment of By-Products Formed in the Hot-Dip Galvanizing Process."

You will note in this article the

technical matter covering the treatment of dross, shows that the best practical method of recovering the largest possible amount of zinc from the dross, is to use a vibrator to shake the good zinc out of the dross before it has time to freeze, in place of the old out-of-date method of cutting and slicing the dross by hand.

It will not pay you to put in a small crucible smelting furnace to distill the zinc, as that is a business in itself.—W. I., Problem 5,680.

### Bright Nickel on Small Parts

Q.—We manufacture a number of small brass and steel parts for which we desire a bright nickel finish.

We use the following process: the steel parts are copper plated, then nickeled over. The brass parts are bright dipped in a solution of two parts sulphuric acid to one part nitric acid, then plated in a nickel barrel. The equipment for nickel plating is a barrel tumbler, 3-gallon capacity, using a patented brightener.

We find that some of the flat parts stick together and do not finish up bright. We are sending solution and a few parts under separate cover. Would you kindly analyze this and inform me whether or not my methods are correct, and where my faults are?

I would also like to know of a good stripping solution that will not require electric current and not cause the parts to become pitted.

A.—The analysis of the solution is:

Nickel .....	2.16 ozs./gal.
Ammonium chloride ....	4.44 ozs./gal.
pH .....	5.9

According to your information the original formula was:

Double nickel salts ...	13 ozs./gal.
Single nickel salts ....	6 ozs./gal.
Amm. chloride .....	4.5 ozs./gal.
Sodium chloride .....	.08 oz./gal.
Boric acid .....	3 ozs./gal.

With this formula it is doubtful if you will keep all of the double salts in solution as the solubility of double salts will not allow the concentration given. Try this formula:

Single nickel salts ....	14 ozs./gal.
Double nickel salts ....	2 ozs./gal.
Amm. chloride .....	3 ozs./gal.
Boric acid .....	3 ozs./gal.
pH .....	5.8

It will be difficult to prevent work from sticking together. Try mixing the loads so that various shapes are

brought together if no other alternative is at hand.

For a bright nickel you will have to use special solutions which can be obtained from advertisers in *METAL INDUSTRY*.

To strip nickel from brass you can use a regular bright dip but there will be some attack of the base metal. Try a dip composed of 1 part each by volume of sulphuric, nitric, and water.

Nickel can be removed from steel by immersing in concentrated nitric acid. Allow no water in the dip as then pitting results.—G. B. H., Jr., Problem 5,681.

### Tarnished Skates

Q.—We are sending you under separate cover two samples of skates. These skates have been plated and lacquered in the same manner. You will note that the buffed one has turned in color like a lacquer bloom, and the brushed one has kept its lustre.

My contention is that the buffed skate has been over heated in the buffing and has caused some action under the lacquer.

We use a good cadmium lacquer which the manufacturer recommends; a mixture of 1 part lacquer and 3 parts thinner. These skates were plated and put in stock last December, so they have taken about six months to turn this color.

A.—An examination of the skate that has turned color shows that in addition to showing color the lacquer film can readily be peeled off.

The cause of this is undoubtedly in the condition of the metal surface before lacquering and is in all probability due to not sufficiently removing the buffing composition. Animal fats in the buffing composition will not be miscible with a lacquer and will cause peeling and also will cause the discoloration.

In cleaning off the composition, using a soap cleaner, care should be taken to thoroughly rinse off the soap. After the soap cleaning the best rinsing procedure is to rinse first in warm water and then in running cold water.

To aid in removing any remaining traces of soap film dip the work in thinner before dipping in the lacquer. If soap film remains on the work peeling and discoloration will occur.

—G. B. H., Jr., Problem 5,682.

# Metal Casting Digest

Short abstracts of articles of interest to practical non-ferrous foundrymen and metallurgists

*A Flow Test for Bearing Alloys.* S. T. Harrison and E. Wood. Metal Ind. (London), Dec. 31st, 1937, page 639.

A flow factor is determined as the rate of flow in a Brinell tested continued for varying durations of time. The use of this factor as an indication of bearing properties is discussed. It has been found that metals with a flow factor significantly higher than .02 tend to be liable to excessive flow, with spreading at the ends of the bearing. If the factor is much below .02, the metal tends to be too hard, does not adapt itself to flexure of the shaft or journal, and tends to seize.

*A Study of Gases in Aluminum by a Complex Method.* I. F. Kolobnev. Tsvetnye Metal. 1936, No. 6, page 115; Chemical Abstracts, Nov. 20, 1937, col. 8478.

Gases obtained by hot extraction from cast aluminum samples were analyzed for CO<sub>2</sub>, H<sub>2</sub>, CO, CH<sub>4</sub> and N<sub>2</sub>. Results: (1) Hydrogen is the prevailing gas in all melts made in air, CO<sub>2</sub>, H<sub>2</sub>O, nitrogen, argon and in a vacuum. The content of various gases varied as follows: H<sub>2</sub> 63-89, CO 0-12, N<sub>2</sub> 0-14, CH<sub>4</sub> 10-31% of total gases by volume. No CO<sub>2</sub> was found. Greater amounts of gases were found in melts made under H<sub>2</sub>O, air and CO<sub>2</sub> atmospheres. (2) The amount of hydrogen in the melts prepared in H<sub>2</sub> atmosphere was not higher than in melts made under other gases. (3) The composition of gases extracted by the hot method does not vary to any great extent with the use of various gas atmospheres. Apparently hydrogen penetrates the molten metal as a result of the reaction of water vapor with oxide film on aluminum. (4) In melting in H<sub>2</sub>O atmosphere carbides and hydrides of aluminum are partially decomposed. Because of large quantity of hydrogen the samples melted in H<sub>2</sub>O atmosphere were very porous. In these samples the amount of Al<sub>2</sub>O<sub>3</sub> was 0.105% at 670°C, 0.122% at 870°C; the amount of AlN was 0.043 and 0.038, and Al<sub>4</sub>C<sub>3</sub> content 0.068 and 0.022% at corresponding melting temperatures. (5) The formation of aluminum nitride was established by analysis. Samples melted under nitrogen or argon atmospheres showed that the nitride content increased from 0.046% in samples melted at 670°C to 0.07% at 870°C. Aluminum nitride is gray and melts at 2200°C at 4 atmospheres pressure. It decomposes in acids, alkali and in water with the formation NH<sub>3</sub>. In solid metal it is located in intergranular spaces. At high temperatures CO<sub>2</sub> reacts with aluminum to form Al<sub>2</sub>O<sub>3</sub> and Al<sub>4</sub>C<sub>3</sub>. The Al<sub>4</sub>C<sub>3</sub> content was 0.160% in samples melted at 670°C, 0.196% in samples melted at 870°C. (6) In all cases the density of metal melted at 670°C was 8-9% greater than that melted at 870°C. All samples cast at 870°C have

By H. M. ST. JOHN  
Associate Editor

coarse columnar structure with the exception of those melted under water vapor, which are very fine grained. It is recommended that aluminum should not be cast at temperatures above 730-50°C. Higher casting temperatures result in increased gas content. The charge should be dried at 200°C before melting.

*Problem of Degasification and Purification of Metals and Alloys.* Henry Lepp. Rev. met., Vol. 34, page 443 (1937); Chemical Abstracts, Nov. 20, 1937, col. 8478.

Theoretical discussion showing that best results are to be expected when deoxidation is conducted by means of proper slags under specific conditions assuring selective oxidation.

*Mechanical Properties of Some White Bearing Metals and Some Other Tin-Base Alloys at Various Temperatures.* C. E. Homer and H. Plummer. Intern. Tin Research Development Council, Tech. Pub. No. 57 (1937); Chem. Abstracts, Nov. 20, 1937, col. 8482.

Tensile strength, Brinell hardness and cooling-curve data were secured for some binary tin-rich alloys and for a number of tin-antimony-copper alloys. Systematic study was made on the effects of varying additions of cadmium to the alloys. Cadmium increases strength and hardness. Three percent cadmium is suggested as a practical limit, since ductility decreases as strength increases. Cadmium content can be limited in some alloys if subjected to high temperatures, since a constituent, probably a eutectic appears which melts at 170°C. Increase of antimony permits more cadmium being retained in solid solution and thus prevents the appearance of this constituent. Alloys of these two series have a low solidus temperature and a long freezing range; thus, segregation is likely to occur. Some specimens were found cracked in the mould; this indicated a large contraction on solidification.

*Tensile Properties of a Series of White Metal Bearing Alloys at Elevated Temperatures.* H. Greenwood. Same reference as last preceding abstract.

Common tin-base and lead-base bearing metals were tested at temperatures up to 175°C. Effect of additions of lead and cadmium to tin-base alloys were studied. Maximum stress and yield point fall uniformly as temperature rises. Addition of cadmium increases tensile strength at room temperature but is not maintained at higher temperatures. Addition of lead is harmful.

*Nonferrous Foundry Builds High and Low Pressure Castings.* Edwin Bremer. Foundry, Dec. 1937, page 26.—A description of foundry practice at the Detroit Lubricator Company, manufacturing red brass and bronze castings of moderate size.

*Gating Nonferrous Castings.* N. K. B. Patch. Foundry, Dec. 1937, page 29.—Describes practice recommended by the author for the leaded bronzes, well illustrated by diagrams.

*A Correlated Abstract on Corrosion and Corrosion-Resistant Alloys.* V. V. Kendall. Metals & Alloys, Dec. 1937, page 355.—Discusses information on the non-ferrous metals and alloys published during 1936, with illustrations of aluminum, nickel-alloy and silicon-bronze castings.

*Modern Refrigeration Needs Modern Metallurgy.* William Mikulas and L. A. Phillipp. Metal Progress, Dec. 1937, page 755.—Includes a description of non-ferrous castings used in refrigeration.

*Fast Metal Melting With Gas Immersion.* J. B. Nealey. Iron Age, Dec. 23, 1937, page 40.—Soft metals, such as lead and the white-metal alloys are melted in a pot or tank in which refractory alloy tubing is installed. Using gas as the fuel, flame and combustion gases, circulate through the tubing which is surrounded by the metal to be melted. Great melting speed and high efficiency are claimed in the casting of stereotypes, battery grids and the like.

*Nickel and Nickel-Base Alloys. Their Use in the Design of Corrosion-Resistant Machinery and Equipment.* F. L. LaQue. Intern. Nickel Co., Inc. Development and Research Div. Bull. T-13 (1937).—A review.

*Exhaust Requirements for Foundry Dust Control.* John M. Kane. Foundry, Jan. 1938, p. 30.—A comprehensive discussion, with diagrams.

*New Foundry is on Fourth Floor.* William G. Gude. Foundry, Jan., 1938, page 35.—A description of the non-ferrous foundry operated in Chicago by the Liquid Carbonic Corp.

*Gating Nonferrous Castings.* N. K. B. Patch. Foundry, Jan., 1938, page 36.—Discussion of gates, risers, drills, etc. with diagrams.

# Modern Production Equipment

New processes, machinery and supplies for metal products manufacturing and metal finishing

## New School of Electroplating and Metallurgy

On September 20, 1938 a new school will be inaugurated which will have as its primary objective the dissemination of knowledge in the field of electroplating and metallurgy. This venture is to be of a cooperative nature, and application will be made for incorporation under the laws of the State of New York as a non-profit-making educational institution. The organization has been formed mainly to give the practical men of the industry, scientific instruction, regardless of their present academic rating. The courses which have been offered on electroplating at Columbia University for the past four years by Dr. C. B. F. Young will not be offered there in the future, but the same subjects will be given at the new school and more time will be devoted to each subject.

This new organization has been founded by former students of Dr. Young who desired to have established in New York City an Institution whose purpose is the education of the men in their industry. Dr. Young will give instruction in Chemistry, Electroplating, Metallurgy, Metallography and Research and will be assisted by Mr. Walter Klinsewich.

Money has been subscribed by the Founders, to purchase equipment and supplies for the school. Tuition will be charged each student registering for each course and at the end of the year any surplus money will be used to buy new equipment and reduce tuition. The cost of the courses will be made as low as possible so that any man in the metallurgical field desiring scientific knowledge may obtain it at a minimum fee within reason. The laboratory will be open during the day and at night so that extra time can be devoted to studies.

The Institution will be governed by the Charter Members and Dr. Young, a Governing Board elected from and by the Charter Members consisting of five men and Dr. Young will settle all questions pertaining to the courses of study, schedule of classes,



Fig. 1. Student using a Haring cell to determine the throwing power of a plating solution

and fees for courses. The Institution hopes also to be of aid to the metallurgical industry. Any plant can send one of their men down to its laboratories to solve problems arising in the shops. The organization stands ready to help both the man and the Company for which he works.

Courses will be offered which will aid the men in the industries in producing better products. The studies will be altered from time to time so as to keep abreast of new developments. Other courses will be added as demanded by the industry. In fact, several courses in related fields are already being considered for the curriculum at a later date.



Fig. 2. Student using a microscope to determine the thickness of an electro-deposit

The following courses will be offered this Fall and Spring:

Electroplating I; Electroplating II; Metallurgy I; Metallurgy II; Research I; Research II.

Electroplating I will consist of a study of chemistry. The course is designed to give the electroplater or industrial worker a foundation in chemistry including qualitative and quantitative analysis. One hour of each evening will be devoted to class lectures in which will be discussed the theories of modern chemistry as applied to electrometallurgy. The three remaining hours will be devoted to the laboratory where the student will conduct his own experiments. This class will be conducted each Tuesday and Wednesday from 7-11 P. M.—Fall term.

Electroplating II is designed to give the electroplater a knowledge of the ways and means of obtaining better deposits by applying the latest scientific methods of electrochemistry to electroplating. One hour of each evening will be devoted to a lecture on the theoretical aspects of the subject and three hours will be spent in the laboratory where the student will apply the principles set forth in the lecture. Copper, nickel, zinc, cadmium, chromium, silver, and brass will be deposited from aqueous solutions. While plating the above metals, the

### Latest Products

Each month the new products or services announced by companies in the metal and finishing equipment, supply and allied lines will be given brief mention here. More extended notices may appear later on any or all of these. In the meantime, complete data can be obtained from the companies mentioned.

**Lever Type Four Point Press.** Single action, with opposed motion rockshafts, No. 4L-1/2-84. E. W. Bliss Co., 1420 Hastings St., Toledo, Ohio.

**Flexible Shellac and Casein.** "Flexilac" and "Protoflex", respectively. Useful for finishing a wide variety of materials, including metals. Glyco Products Co., Inc., 148 Lafayette Street, New York, N. Y.

**Universal Indicator.** A new precision tool, No. 199, with rotating head, positive lock, and two reading faces, suitable for jig boring, milling machines and drill press work. The Lufkin Rule Co., Saginaw, Michigan.

**Spray Gun.** High speed, heavy duty, Type MBC-527; for porcelain and ceramic materials. DeVilbiss Company, Toledo, Ohio.

**Improved Mauser Precision Tool;** can be used as a Vernier caliper and a height gage. George Scherr Co., 128 Lafayette St., New York.

**Super-Ammoniated Fatty Acid Soaps;** water dispersible and readily drying. Excellent emulsifying agents for use in cleaning metals and other materials.

**Cement Cleaner;** cleans, whitens and hardens cement floors, driveways and runways. Magnus Chemical Co., Inc., Garwood, N. J.

**Hydraulic Footlift Truck.** No head or side room required. Capacities up to 8,000 lb. Lewis-Shepard Sales Corp., 245 Walnut St., Watertown, Mass.

**Air-Operated Agitator.** "Pneumix Type B", to handle material up to 100 balloons, spark-proof and non-heating. Especially recommended for inflammable organic compounds and solvents. Eclipse Air Brush Co., Inc., 390 Park Ave., Newark, N. J.

factors governing the character of the deposit, such as current density, temperature, pH, etc. will be noted. Other experiments will include throwing power, single electrode potential, addition agents, resistance of solutions, anodizing and coloring aluminum.

corrosion tests, etc. After these are complete the student will prepare standard solutions and make analyses of all the important constituents of the above plating baths. Tuesday and Wednesday, 7-11 P. M.—Spring term. Prerequisite: Electroplating I or its equivalent.

In Metallurgy I the student will be introduced to the structure of metals and alloys and factors are taken into account which affect these, such as temperature, mechanical working, etc. The application of the phase rule to physical metallurgy will be discussed. Both binary and tertiary systems will be studied and illustrated. Heat treating, surface treating and testing of metals and alloys will be studied. Wednesday—8-9 P. M.—Fall term.

Metallurgy II (Metallography) is designed to teach the student the preparation of metallographic samples for microscopic examination. The student will prepare several samples of various metals and alloys, etch and then examine them under the microscope. He will be taught to detect faulty alloys and metals by such examinations. Both ferrous and non-ferrous metals will

be analyzed. Wednesday—7-11 P. M.—Spring term. Prerequisite: Metallurgy I.

Research I is designed to give the practical electrochemist a chance to investigate problems in his field. One half hour per week is devoted to a conference with the instructor in which the method of attack is laid out. The remaining time is spent in the laboratory where the student applies the knowledge and technique to the solving of problems which arise in such an investigation. Tuesday and Wednesday—7-11 P. M.—Fall term.

Research II is the same as Research I except this is given in the Spring term.

The courses Electroplating I and II and Research I and II are identical with the courses which have been offered at Columbia University by Dr. Young for the past four years. The New York Branch of the American Electro-Platers' Society is among the backers of the Institution. Mr. Olin C. Johnson, electrical engineer has been selected as a trustee.

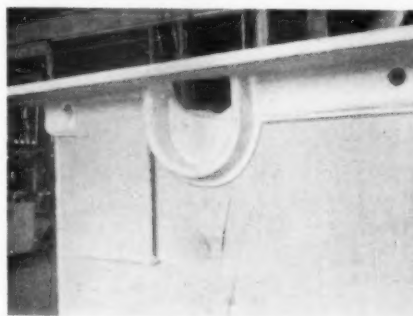
For further information call Dr. C. B. F. Young at Flushing 9-1685 or write to Box 292, Flushing, L. I., N. Y.

## Tank Lining\*

Collord, Inc., 7049 Lyndon Ave., Detroit, Mich., announce a new and improved S. R. L. (Seamless-rubber-lining) for tanks and other containers, for use by the plating and chemical industries. This improved rubber lining is said to represent an entirely new technique in latex rubber formulation.

"Multi-Ply" S. R. L. is "tailored" to the walls of tanks, etc., in a single, seamless, smooth, unbroken finish, bonded to the metal or wood. Improved bonding methods permit the use of "Multi-Ply" S. R. L. under high temperature (212 F.) conditions, where contents permit.

Samples of "Multi-Ply" S. R. L., \*This item which appeared in our August issue contained a typographical error. For that reason it is repeated, with the error eliminated.

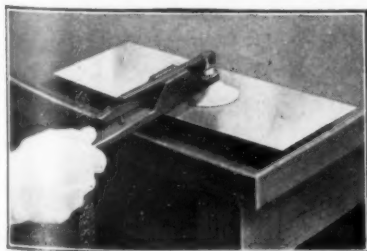


Collord S. R. L. for tanks

bonded to metal, together with an interesting booklet, "S. R. L. Tanks" will be mailed on request.

## Safety Vacuum Lifter

A practical and durable device to prevent accidents to the fingers and hands of machine operators is the Ipco safety vacuum lifter manufactured by Industrial Products Co., 800 W. Somerset St., Philadelphia, Pa. This device is built to lift and hold parts securely, releasing instantly when the vacuum is broken by the operator. It is especially recommended for lifting, feeding and positioning sheet metal blanks in stamping machines and die press operations. Hands



Industrial safety vacuum lifter

or fingers need not be inserted within the danger line.

The lifter can be used on any metal and a variety of other materials; also blanks of curved contour. Dampness and oily or greasy surfaces, it is stated, improve the lifting qualities.

## Slide Comparator

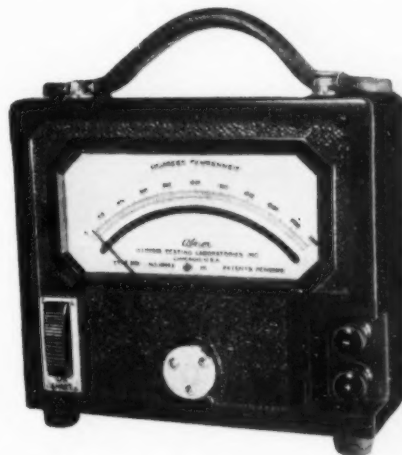
W. A. Taylor & Company, 872 Linden Avenue, Baltimore, Md., announce a new slide comparator for pH control work in the electroplating industry. The comparator is small, compact and readily portable. The color standards are enclosed in a Bakelite case; no loose standards to be inserted and removed in making pH determinations. The comparator is unaffected by water, acids or alkalis and chances of loss or breakage from handling individual standards are at a minimum.

Determinations are made simply by slid-

ing the color standards in front of the test sample until a color match is obtained. No technical training is required for using this set.

## Pyrometer

Illinois Testing Laboratories, Inc., 420 N. LaSalle St., Chicago, Ill., have developed a new type of shock-proof port-



Illinois shock-proof portable pyrometer

able pyrometer. The essential features of this instrument are:

1. Spring suspended movement within the case to minimize shocks and jars.
2. Shock resisting movement with pivots and jewels especially designed to unusually severe service.
3. New type pointer lock to damp the movement of the instrument when carried or transported.
4. Unusually heavy metal case to prevent breakage if dropped.
5. Shatter-proof glass.
6. Scale length—5 inches.

## Nickel Alloy

A new nickel alloy called "Z" nickel combining the corrosion resistance of nickel with the mechanical properties of heat-treated steel, is announced by the International Nickel Co., 67 Wall St., New York. This alloy, which contains 98% nickel is the result of more than six years of laboratory work and field study.

"Z" nickel has been produced with tensile strength as high as 250,000 lb. per sq. in. and hardness values as high as 46 Rockwell C. In its annealed condition, it fabricates almost as easily as pure nickel, taking such operations as bending, drawing, machining and hot forging. The alloy can be heat treated after fabrication at temperatures 890° to 930° F.

The alloy is produced commercially as hot rolled or cold rolled strips in a wide range of sizes and various tempers; unhardened or heat treated. It is said to have been used with success for hand tools, wire brushes, spring clamps, spring coils and a variety of electrical applications.

## Induction Type Zinc Melting Furnace

An induction type electric melting pot for low melting point metals is announced by Detroit Electric Furnace Company, Detroit, Michigan. Although designed as an auxiliary unit for use in conjunction with die casting equipment, the furnace may also be used as an independent melting unit for zinc and zinc-base alloys. The furnace is well insulated so that working conditions and surrounding temperature near the furnace are materially improved over older methods. It is equipped with suitable controls to provide automatic regulation of power input and metal temperature to give a uniform product of high quality at the temperature desired and with a minimum of oxidation of the metal.

A development installation has been in operation at the plant of Michigan Die Casting Company in Detroit and is being operated as part of one of their own die casting machines. Nominal holding capacities are from 700 lbs. to 2500 lbs. per unit; melting speeds are 500 lbs. to 800 lbs. per



*Detroit induction furnace for zinc-base die casting alloy*

hour depending upon production requirements.

The electrical supply required is 230 volts—60 cycle-single phase with maximum rating of 75 KVA.

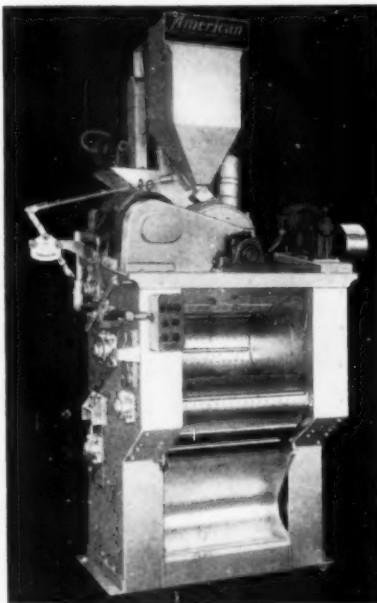
## Blast Cleaning Small Parts

A new, small Wheelabrator Tum-Blast, known as the 20" x 27" model, having an operating load capacity of two cubic feet, is now being marketed by the American Foundry Equipment Company, 408 S. Byrkit Street, Mishawaka, Indiana.

According to a factory announcement this equipment now provides an airless abrasive blasting unit for the plant having a limited volume of small pieces to clean or for the plant desiring an auxiliary unit to handle moderately light loads of small pieces. The type of work which this machine will clean includes: castings, forgings, heat treated parts, springs, stampings, etc.

The 20" x 27" Wheelabrator Tum-Blast is designed like the other Tum-Blast models and operates in a similar way. The principal difference of construction lies in the use of a wear-resisting rubber conveyor instead of a metal conveyor for tumbling the work. The design of the conveyor gives the work a gentle tumbling action in which the pieces cascade one over the other. The Wheelabrator unit is mounted directly over the load and the blast is controlled so that the entire load is subjected to the blasting action.

The machine is thoroughly protected from the action of the blast at all points of wear and bearings and working parts are



*Wheelabrator Tum-Blast 20" x 27"*

sealed from dust. A total of 6 horse power are required for operating this machine.

## Air Dusting Gun



*DeVilbiss air dusting gun*

A new air dusting gun, designed to meet

the demand for a more compact, lower-priced duster, has been announced by The DeVilbiss Company, Toledo, O. Known as Type DGA, this improved gun has an air capacity equal to that of a large standard model duster, yet is small enough to be held completely within the hand.

The gun is operated by simply closing the hand around the gun in any reasonable position, and squeezing the one-piece thumb button and valve stem located in the middle of the gun body. An opening is provided in the zinc die casting body for

hanging the duster on a hook when not in use. A removable brass nozzle is threaded into the gun body.

High pressures direct from the main air line or lower pressures may be used in operating the duster, which has an air consumption of 13 cubic feet at 80 pounds pressure. New straight line design puts the nozzle practically in line with the air hose, permitting use of the tool in close quarters without kinking or bending the hose.

Among the operations for which this new dusting gun is recommended are: blowing chips, dust, shavings, etc., away from metal and wood-working machines; evaporating solvents rapidly in cleaning operations; final cleaning of surfaces before painting or finishing, etc.

## Gas Mask for Organic Vapors

The Acme Protection Equipment Company, Inc., 3664 Liberty Ave., Pittsburgh, Pa., manufacturers of respiratory protective devices, announces official approvals of Acme Full Vision Gas Masks Nos. 4 and 4A by the U. S. Bureau of Mines for organic vapors.

An outstanding and exclusive feature of these new masks is the full vision safety glass lenses which permit the wearer to see the same as when not wearing a mask. Another exclusive and important feature is the dead air check valves on the outlet ends of the fresh air ducts. These valves automatically open and close upon inhalation and exhalation, and prevent the accumulation of exhaled breath in the fresh air ducts.

A light weight, all rubber face piece, fully molded and cured to master face fitting proportions, provides utmost comfort to the wearer. There are no rivets, threads or adhesive tape pads to irritate the face, and the head harness buckles are incorporated in such a way as to eliminate uncomfortable pressure points on the wearers face and forehead.

The new Acme full vision gas mask weighs less than any other approved gas mask.

Copies of informative new literature just off the press, designated as Folder M387, are available either by addressing this magazine or writing the manufacturers direct.



*Acme full vision gas mask No. 4A*

## Bright Zinc Plating in Still Tanks, Semi- and Full Automatic

The Mazic process developed by the Hanson-Van Winkle-Munning Co., Matawan, N. J., manufacturers of electroplating equipment and supplies, yields zinc deposits which are bright and lustrous and which are very similar in appearance to cadmium deposits. The following conditions must be observed, however, in order to obtain the best results from Mazic solution.

### Solution:

Zinc Cyanide .....	8 oz./gal.
Sodium Cyanide .....	5 oz./gal.
Sodium Hydroxide .....	11 oz./gal.
Mazic Brightener .....	1½ gal. to 100 gal.
which will analyze when in solution, approximately:	
Zinc .....	4.5 oz./gal.
Total Sodium Cyanide ..	12 oz./gal.
Sodium Hydroxide .....	11 oz./gal.

The optimum proportion of this material is 1½ gallons to 100 gallons of plating solution.

### Operating Conditions

The permissible cathode current density of the solution is much higher than in ordinary zinc solutions. It is truly a *high speed* plating bath. Good results are obtained with a cathode current density of from 40-60 amperes per square foot with an optimum of 45 amperes per square foot. A voltage at the tank of between 3 and 4 volts is essential to insure proper operation of the solution. With a current source of 6 volts pressure a 2 volt drop rheostat is recommended. The solution should not be operated at temperatures below 75°F nor above 110°F. A good working range is between 75-100°F.

Unlined steel tanks should be used for this solution.

### Anodes

Only Mazic anodes can be used in this solution. These anodes are made from special alloy cast under controlled conditions. There is no sludge. The solution remains clean and the deposits are free from roughness or sludge inclusions. There is no chemical attack of these anodes when the solution is not being used; also these anodes do not polarize. It is unnecessary therefore, to remove them from the solution at any time. The anode area should be approximately 1½ times larger than the cathode surface. Ball anodes may be used advantageously. The ball anode containers should be spaced about three to each foot of anode rod.

### Rinsing and Bright Dipping

After the work has been plated it is necessary to rinse thoroughly before the bright dip, to remove the highly caustic film of plating solution. The rinse water should be clean. If nickel, cadmium or copper from previous rinsing operations is carried into the bright dip, staining will occur.

The work is dipped for a few seconds in the bright dip which consists of a ½% nitric acid solution. In regions where the water is highly chlorinated, the bright dip

should be boiled for a few hours and allowed to cool before using.

The work is again rinsed in cold water and for best results, dipped in a solution of 2 oz./gal. of sodium cyanide, then rinsed in cold water, then in hot water and dried.

### Lacquering Mazic Plated Work

Ordinary lacquers are not satisfactory over zinc deposits. A special lacquer has been developed for use over bright zinc and its use is strongly recommended for work that is subjected to outdoor exposure or to constant handling.

## Tubing for Oils and Solvents

Resistoflex Corporation, 370 Lexington Avenue, New York, announces the completion of facilities at their Dover, New Jersey plant, for the manufacture of "Resistoflex" PVA Tubing in diameters up to and including ½" I. D. Facilities will be provided in the future for the production of larger sizes.

"Resistoflex" is the trade mark and trade name employed in the American production of a flexible synthetic resin—basically, polyvinyl alcohol—which is inert to gasoline, oils and organic solvents; which retains its flexibility throughout a wide temperature range, and which has been manufactured, tested and sold on a commercial scale during the past several years by foreign corporations with which Resistoflex Corporation is indirectly affiliated.

The material, it is claimed, is the only commercially-known substance that is completely insoluble in gasoline, oil . . . the aliphatic compounds and aromatic series of hydrocarbons—ethers, esters, alcohols, ketones, etcetera.

Physical characteristics of "Resistoflex" include extreme lightness—the specific gravity is approximately 1.26, one-half that of aluminum; great toughness; a remarkable pressure-resistance; good elasticity; and a flexibility so marked that "Resistoflex" tubing literally may be tied in knots. It is highly efficient in absorbing vibration. Under normal conditions of use over a long period, it shows no trace of wear, fatigue or deterioration.



Resistoflex PVA tubing

A complete engineering report upon exhaustive chemical and physical tests of "Resistoflex" is now being prepared, and soon will be published and made available.

## Clear Finishes

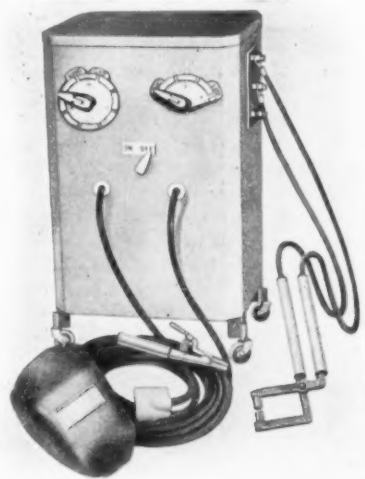
A new line of clear finishes for industrial use is announced by the Finishes Division of E. I. du Pont de Nemours & Company, Wilmington, Del. The development represents another step in the expansion of the methacrylate resins into the finishes field.

These resins, it is stated, afford unusual adhesion and flexibility over bare, non-ferrous metals such as aluminum, chromium and brass. They deposit a glossy, water-white film which dries rapidly by evaporation. The coating is hard and non-yellowing, resistant to acids, alkalis and alcohol. It has demonstrated satisfactory durability under outdoor exposure.

The new finish may be applied by any of the usual methods, such as brush, spray or dip. It has been designated as the RC-900 line.

## Arc and Spot Welder

A combination arc and spot welder, illustrated here, is announced by Miller Electric Mfg. Co., Appleton, Wisconsin, as an addition to their present line of arc welders. The spot welder is built into their regular No. 2 and No. 3 welders, with capacities of 165 amperes for the No. 2 and 220



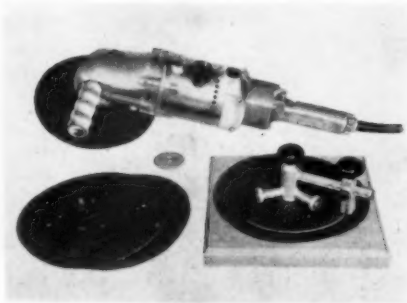
Miller arc and spot welder

amperes for the No. 3. These units are designed to provide arc welders of ample capacity to handle electrodes from 1/16" to ¼", and have 32 heat controls, enabling the operator to weld from the lightest to the heaviest metal, and with the addition of the spot welder will handle all sheet metal work. The spot welder itself has a number of heat controls for different thicknesses of metal. Special spot welding tongs, shown with the welder, are made in different styles to handle individual applications. This new welder is patented in the United States.

## Two-Speed Electric Sander

A versatile two-speed sanding unit, adaptable to use with both 7" and 9" abrasive discs, has recently been announced by the Van Dorn Electric Tool Co., Towson, Maryland; developed to eliminate the necessity of purchasing two tools of different speeds in order to use 7" and 9" discs. As most of the wear on a sanding disc occurs toward the outer edge, it is possible, with this new machine, to get maximum wear from a 9" disc and, by trimming off the worn outer surface, obtain a 7" disc that is practically unused. A disc cutter is furnished with each tool.

The speed adjustment is made by means of a simple gear shift arrangement in the gear housing, which alternately engages two different sets of double gears. Armature and intermediate gears are spiral and the spindle gear is spiral-bevel. The unit is equipped with a patented gear locking pin to facilitate interchange of flexible pads and the gear-shifting adjustment.



*Van Dorn two-speed electric sander*

Two moulded pads (7" and 9"), together with three 9" abrasive discs are supplied with each tool. The no-load speed for the 7" discs is 4,200 r.p.m.; for 9" discs, 2,700 r.p.m. A universal motor, operating on alternating or direct current, is standard equipment.

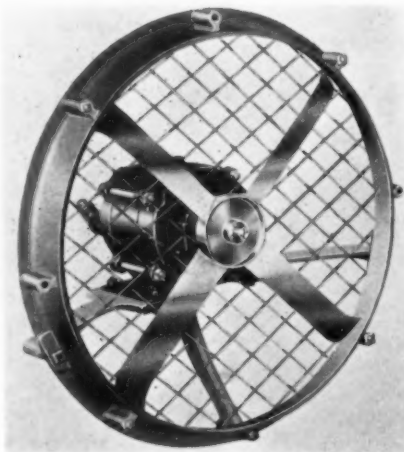
## Exhaust Fan

A new exhaust fan, designed to effect rapid movement of a large volume of free air, has been added to the standard line of The DeVilbiss Company, Toledo, O., according to a recent announcement.

These fans, available with 1/4 H.P. or 1/2 H.P. direct-connected electric motors, are said to provide an effective and economical means of exhaust wherever a general vapor, fume or dust condition prevails. They are built for use with spray-finishing equipment as well as for other exhaust purposes.

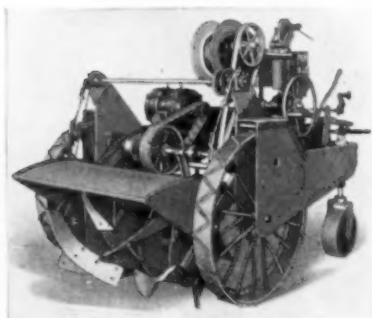
Ball-bearing, explosion-proof electric motors with which the fans are equipped meet the requirements of the Fire Insurance Underwriters for handling hazardous as well as ordinary vapors, fumes and dust. They can be installed in window, wall or ceiling openings provided for this purpose.

The 1/2 H.P. motor turns a four-bladed fan 1725 R.P.M. to move 6,350 cubic feet per minute. Where exhaust volume requirements are somewhat less, the two-bladed fan on the 1/4 H.P. motor removes 5,250 cubic feet per minute at the same R.P.M.



*DeVilbiss exhaust fan*

## Sandcutter



*American Model AM sandcutter*

A simplified new sandcutter, known as Model "AM" is now being built by the American Foundry Equipment Company, 408 South Byrkit Street, Mishawaka, Indiana, for the foundry requiring a small size unit.

This machine is designed and recommended for use on light to medium floors. It is made in two standard sizes with cutting cylinders of 45" and 50" in length. The maximum clearance over the sand is 26". The width overall for each machine is 68 1/2" and 73 1/2" respectively and the height overall is 81".

Two motors provide power for all operations; one motor is used for operating the

cutting cylinder and the electric cable reel; the other motor is used for operating the ground travel drive. The cutting cylinder is elevated and lowered by means of a hand operated cable hoist. A hand lever is provided for steering. An equalizer provides complete flexibility to the frame when maneuvering over uneven floors.

Electric controls are located convenient to the operator. A high-pressure grease system provides complete lubrication for all working parts. Safety guards are used wherever necessary.

## Cleaning and Deodorizing

Said to combine the dual principle of simultaneously cleaning and effectively deodorizing, a new material has been developed and is now available for use by industrial concerns having an odor control problem either in connection with processing operations or in general plant housekeeping.

This new material, odorless itself, has the property of counteracting odors without creating another. It does not, in other words, replace one odor with another. It is designed not only to dissipate previously formed odors, but also, it is said, to be extremely effective in those cases where odor formation is continuous.

Known as Oakite Deodorant No. 1, this product, a development of the Research Laboratories of Oakite Products, Inc., 14 Thames St., New York, N. Y., is being used in institutional, commercial and industrial plant housekeeping operations for cleaning in plant cafeterias, cleaning and deodorizing lavatories, and other such work where destroying disagreeable and unpleasant odors is desirable.

## Combination Flock and Binder Booth

A new flock reclaiming and adhesive coating booth has been designed by Paasche Airbrush Co., 1909 Diversey Parkway, Chicago, Ill. The binder is applied in the right section and the flock is applied and reclaimed in the left section of these special steel booths. Maximum light and working space are provided and material accumulation is eliminated; cleaning is easy.



*Paasche combination booth*

# 1% NICKEL *made 'em...*

## ...100% HAPPIER



**FOUNDRY FOREMAN** quit cussing when 1% Nickel increased fluidity and promoted better casting qualities from heat to heat.



**BOSS** started smiling when rejects stopped eating profits — no foundryman ever gets rich on rejects. Nickel added to bronze assures pressure tightness, increases tensile and compression strength, adds hardness with little or no loss in ductility; simplifies machining.



**CUSTOMER** relaxed when these Nickel bronze castings for locomotive boiler feed pumps withstood required pressure tests—and were sound and dense throughout.



**CONSULTING ENGINEER** beamed when finished Nickel bronze castings held pressures and, despite high temperatures, "proved satisfactory in every way."



### PRESSURE-TIGHT CASTINGS

These locomotive boiler feed pump castings were produced of a Nickel bronze composition:

COPPER .....	85%
ZINC .....	5%
LEAD .....	5%
TIN .....	4%
NICKEL .....	1%

Castings by Textile Machine Co., Reading, Pa., for J. S. Coffin Jr. Co., Englewood, N. J. E. L. Schellans, Consulting Engineer.

## CAST NICKEL BRONZES

**THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.**

The air distributing plates are readily removable, providing a uniform flow of air throughout both sections. A special removable curtain at the front of the flock section is provided to prevent any possibility of sprayed flock scattering around the air finishing room. Excess flock drops from the collector screen into the flock collector pan

at the bottom from which it can be reclaimed and immediately used again.

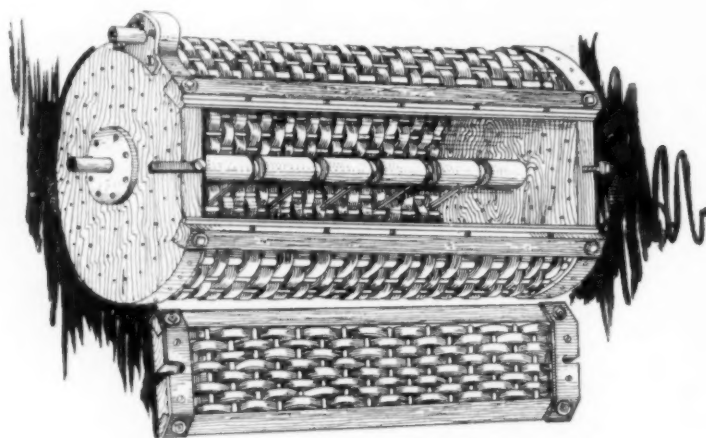
The Paasche Airbrush Co. has also developed a new flock airbrush, Type FPRF, and a new pressure flocktank, Type FF613. This tank embodies the easy opening, easy locking "clamptight" cover which can be removed and replaced in fifteen seconds.

## Woven Oak Plating Barrel

An interesting type of plating barrel is manufactured by John King, 48 Springfield St., Dayton, Ohio. This barrel is constructed of woven white oak. It is so designed that the woven cylinder does not rattle the work but gently agitates it. The cover is made flat so that in each revolution the work is completely rearranged. The inside contacts can be easily removed, cleaned and replaced.

For small work, close woven barrels are supplied; for general run of work, open weave is recommended.

Speed of rotation is only  $1\frac{1}{2}$  to 2 R.P.M., which results in reduced wear. The barrel is recommended for all solutions operated at not over 125 deg. F., and containing not more than 8 or 10 ounces of cyanide per gallon.



King woven oak plating barrel

## Cylindrical Filtering Unit

Among the new equipment announced for the Fall by American Seitz Filter Corp., 480 Lexington Ave., New York, is the Seitz Tank Furka which features an original cylindrical filtering unit. This cylinder provides a larger filtering surface in a compact container having the advantage of greater simplicity in operation and handling.

By employing the alluvial or pressure leaf system, the Seitz Tank Furka assures a sharp filtration of liquids with any degree of viscosity or turbidity, since differing grades of asbestos, filter-aid or charcoal may be used in any combination to meet the special requirements of a liquid. The filtering medium sets instantly and has a long run of crystal-clear filtrate. The exhausted filter layer is easily "peeled off" the cylindrical frame as if it were one sheet. The new run always begins with fresh filtering material, which makes for cleanliness and safety.

The standard construction of the Seitz Tank Furka Filter includes tank of nickel-lined steel; heavily tinned bronze filter frames; Monel screens; fittings, pipings and connections of tinned bronze. Any other

metals may be specified. All models are offered either as a single filter unit, or as a complete set-up with filter, mixing tank, pump and motor, piped on a movable carriage.



Seitz Tank Furka

## Polishing Wheel Balancing Stand

A device for balancing grinding or polishing wheels from the smallest size up to 18" in diameter and 7" in width is the Excelsior polishing wheel balancing stand No. 98, made by the Excelsior Tool & Machine Co., Ridge Ave., 30th to 32nd Sts., E. St. Louis, Ill.



The top surfaces of this stand as shown in the illustration consist of hardened accurately ground tool steel inserts in machined slots  $1" \times \frac{1}{4}"$  to resist rough handling and assure permanent alignment, and to keep the stand sensitive and accurate. The stand can be placed in any desired location in the glue room or for rechecking at the polishing lathes.

Full details can be obtained from the manufacturers.

## Flux for Faster Soldering

A new non-corrosive soldering flux for brass, tin, bronze and copper, designed primarily to meet the needs of fast soldering on a mass-production basis, is now being marketed by The Ohio Carbon Company, 12508 Berea Road, Cleveland, Ohio. It is said to penetrate the joints thoroughly and quickly, having been originally evolved in the Company's laboratories for use on a specially difficult soldering problem in their own manufacturing processes where all commercial liquid soldering fluxes had been unsuccessful and where the job had to be unusually good and be capable of resisting corrosion under bad humidity conditions. The Company states that the use of this flux has practically doubled the speed of production. It is specially recommended on both repair and production jobs where the metal surfaces are reasonably clean.

## Cleaner

A new cleaning compound is announced by the Curran Corporation, Malden, Mass., manufacturers of Gunk self-emulsifying, degreasing solvent. Gunk Compound M for degreasing and cleaning metal surfaces is chemically neutral, but able to dissolve oxidized oil and grease, buffing compounds and emulsified compounds, so that they may be instantly removed by rinsing with water. It is recommended for use on soft metal parts such as zinc die castings, extruded aluminum, etc., and it is stated, also has the advantage of being very low in cost, non-evaporating and non-toxic.

## Protective Skin Cream

Skin irritations and discolorations (Industrial Dermatitis) resulting from the handling of acids, dyes, oils, pigments, etc. may now be guarded against by the use of a new protective skin cream, announced by the Dermo Company, Chicago. This new cream, called "Casil," is rubbed onto the skin, dries quickly, and forms a protective film which prevents contact of irritating materials with the skin. It is said to protect against any material containing more than 2% water.

Casil resembles cold cream in consistency and appearance. It is not sticky or gummy, does not interfere with any kind of work, and can be rinsed off in plain running water, removing at the same time, also, any foreign matter. It has been submitted to and accepted by the American Medical Association for industrial and professional use.

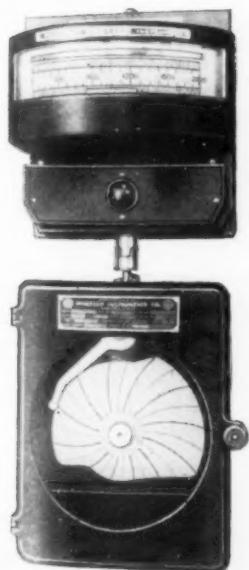
Samples and literature may be obtained from The Dermo Company, 180 North Wacker Drive, Chicago, Illinois.

## Wheelco Program Control

Wherever variable temperature control is required over any period of time, the Wheelco Program Control is offered. Any desired temperature program can be automatically carried through to completion without supervision.

The Program Control consists of the program unit and a Wheelco Controller mounted integrally. To the temperature control setting pointer of the Wheelco Capacitrol is attached an idler arm which rides on the edge of the contoured disk of the program unit. The program disk is rotated by a synchronous motor through a gear reduction.

The Capacitrol operating on the Wheelco "Radio Principle" controls the temperature of the furnace to any point set on the scale by the setting pointer; thus with the Program Control, the temperature at which the Capacitrol controls is governed



Wheelco  
temperature  
program  
control



(Patent Pending)

## The Beautiful, Luxurious Imitation Gold Plate

Appearance is a highly important sales factor—GOLDGLO gives your product the magnetic glamour of gold that builds sales volume.

GOLDGLO makes possible the use of a gold finish on articles whose price range prohibits the use of actual gold. The 18 kt. color of GOLDGLO is rivalled only by gold itself.

and easy to operate. It plates directly over brass, copper, nickel, german silver, iron and steel; it also plates over all hard solders, and a majority of soft solders.

GOLDGLO has extremely high throwing power. It penetrates to remote recesses to plate as evenly as on flat surfaces.

Made by the makers of  
SPEKWITE.

**GOLDGLO is economical to use**

Write for additional information.



**SPECIAL CHEMICALS CORP.**  
30 Irving Place

**New York, N. Y.**

Your Product Must Not Only Be Good—It Must Look Good!

by the position of the idler arm on the program disk over any desired period of time.

The contoured disk can be cut to any time cycle desired with any variation of temperature control. The disk can be easily removed and replaced by other contoured disks to suit any required heating program.

Complete data will be furnished on request by Wheelco Instruments Co., 1933 So. Halsted St., Chicago, Ill.

## Portable Grinders

The Black & Decker Mfg. Co., Towson, Maryland, announces two completely new high speed portable grinders with wheel size capacities of 2" and 2½". These are



Black & Decker 2½" grinder

precision tools, having a no-load speed of 19,000 r.p.m.; an overall length of 13½" and the very light weight of 3½ pounds and 4½ pounds, respectively.

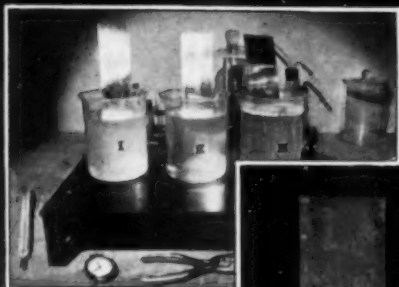
They were designed for use where a small size wheel is required, for versatility in their general application and for ease in handling where accuracy and fine grinding are necessary.

## Industrial Skin Lotion

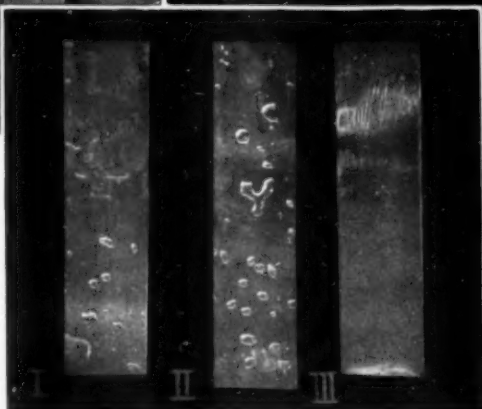
"Delure" is the trade name given by the American Solder & Flux Co., Wayne Ave. and Berkley Street, Philadelphia, Pa., to their new skin lotion for workers.

This preparation is recommended for use around such materials as soldering, fluxes, welding or cleaning compounds, slushing, quenching or machine oils, or any harmful substances which may come in contact with the skin of the employees. Delure may be used daily and the cost per employee is about one cent per month.

## INTERESTING CLEANING DISCOVERIES THAT LED TO IMPORTANT PRODUCTION SAVINGS



#5 STEEL  
STRIP



### THE PROBLEM

To thoroughly clean continuous strip steel in 90 seconds or less, without leaving tell-tale oil and water breaks.

### THE ANSWER

A solution of MAGNUS 94-R... which completely eliminated all foreign matter within 60 seconds.

## CUT CLEANING TIME 33% with MAGNUS 94-R

In the case illustrated above, you see the dramatically greater cleaning power of MAGNUS 94-R as compared with two other cleaners. All three were tested under exactly the same conditions (MAGNUS 94-R is in beaker III). Note how the MAGNUS-cleaned strip (No. III) is absolutely free of the water breaks seen on strips I and II. Actually, the well-known steel company that adopted MAGNUS on the basis of this test found that it required 33% less time to do a thorough cleaning job.

## MAGNUS 94-R

is an entirely mineral cleaner. The sudsing action in beaker III is due to the cleaner's colloidal properties and unusually low surface tension which give it greater cleaning effectiveness.

There are MAGNUS CLEANERS to eliminate water breaks, time loss, and rejects from your cleaning problems. Ask to have our service representative demonstrate under your own working conditions. Or, send us the details of your operations for our specific recommendations.

## MAGNUS CHEMICAL COMPANY

Manufacturers of Cleaning Materials, Industrial Soaps, Metallic Soaps, Sulfonated Oils, Emulsifying Agents and Metal Working Lubricants.

11 South Avenue

Garwood, N. J.



# MAGNUS CLEANERS

### Respirators Approved

Mine Safety Appliances Company, Oliver Bldg., Pittsburgh, Pa., announces official approval by the U. S. Bureau of Mines of the M. S. A. Air Line Respirator, and the M. S. A. Abrasive Mask. This makes respiratory protective equipment bearing the Bureau of Mines approval, available in many common industrial operations and processes

which expose the worker to harmful dust and fumes.

The Air Line Respirator is designed to provide complete protection against welding and cutting fumes, paint spray vapors and pigments, fumes from molten or burning metals and toxic dusts.

The Abrasive Mask which weighs less than 4 pounds, is recommended for use in the heavy concentrations of fine dust present in shot and sand-blasting operations.

### Spray Nozzles

Spraying Systems Co., 4922 W. Grand Ave., Chicago, Ill., has developed a new line of spray nozzles for metal cleaning processing and various industrial washing operations, or wherever a sharp, flat, hard-hitting spray is required.



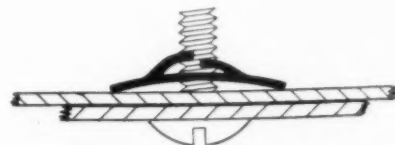
Sharp, flat spray nozzles

These "Flatjet" spray nozzles are of sturdy construction, accurately machined and are available in male pipe connections from 1/4 to 3/4 in. and in capacities ranging from 1 to 20 G.P.M. at 40 pounds pressure. Standard stock construction is brass. Other materials can be specified.

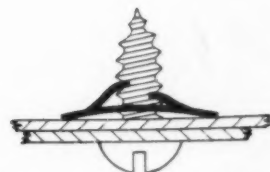
### Spring Tension Speed Nuts

A patented spring tension "speed nut" for use on machine screws, sheet metal screws and rivets of most standard sizes, has been developed. This new speed nut eliminates threaded nuts and lock washers and holds assembly parts together under firm spring tension. It therefore is immune to loosening from vibration. Another feature is its ability to absorb stresses and strains on the sheet metal or other parts that are being held together.

When used in the assembly of porcelain enamel structures, it is said to prevent checking and cracking. In the assembly of any sheet metal product, it also prevents buckling and bulging of panels as the spring tension speed nut also absorbs expansion and contraction due to temperature changes.



MACHINE SCREW



SHEET METAL SCREW



RIVET

Tinnerman "Speed Nut"

Its most unique feature, however, is its surplus gripping power, which is best explained by the fact that the harder the pull, the firmer the speed nut grips the bolt, screw, or rivet. It has a wide gripping area on the assembly part, and is not tightened down to the breaking point. Consequently excess pulls and strains intensify the grip by compressing the arc and pushing the teeth in deeper. It is made by Speed Nut Division, Tinnerman Stove & Range Co., 2054 Fulton Road, Cleveland, Ohio.

### Metal Cleaner and Polish

The Pynosol Laboratories, Inc., 166 N. Aberdeen St., Chicago, Ill., have placed on the market a new metal polish and cleaner called Alumin-Nu for keeping chromium, nickel, copper and brass bright. Alumin-Nu is a soft cream, it is stated, containing no acid, alkali or sharp abrasive. It dissolves oxides leaving no white powder film.

### Brightener for Barrel Nickel

Platers Research Co., 72 Grand Ave., Brooklyn, N. Y., has developed a new brightener for nickel barrel plating called "Nickelite." This material is an addition agent which it is stated, gives a lustrous finish to a deposit, eliminating the burnishing operation after plating. It is said to work well over wide and changing pH values and to be harmless to nickel solutions.

### Lacquer Spray and Solvent Hose

"Magic" lacquer spray and solvent hose—NY-1616—synthetic lined—has been announced by the New York Belting & Packing Company, 1 Market St., Passaic, N. J. Lacquer and synthetic enamel sprays usually contain butyl acetate and other solvents whose action is destructive to rubber, but this new hose has proven itself superior for this purpose, it is claimed. Thousands of feet are already in use in the automotive industry for automobile and truck body lacquer spraying.

"Magic" hose is also recommended for use as a solvent hose, particularly in conditions where elevated temperatures up to 150 degrees play a part. Because the tube is of synthetic stock practically no swelling develops when it is used as a solvent hose. In the smaller sizes this feature is of great value as construction of flow due to swelling is reduced to a minimum.

The inner tube, made of a high grade synthetic rubber material, will resist the action of oils and commonly used paint solvents, in addition to lacquer solvents. It will not discolor delicate shades of paint. The body, of braided reinforcing plies of high grade cotton, has a smooth molded black cover of oil and abrasion resisting rubber stock.

Available in sizes  $\frac{1}{4}$ " to  $\frac{3}{4}$ "—1 and 2 braid.

"Magic" lacquer spray  
and solvent hose

# CHROMIC ACID

Recognized as the world's largest manufacturer of chromium chemicals, Mutual brings to the plating industry a basic source of chromic acid.

Our facilities cover every step in its production, from the mining of the chrome ore on a remote island in the Pacific to the wide distribution of the finished product through warehouse stocks in the principal consuming centers.

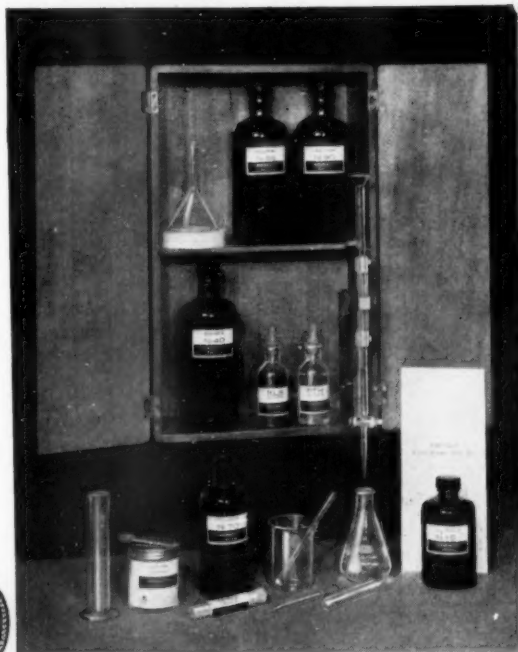


CHROMIC ACID  
OXALIC ACID  
BICHROMATE OF SODA  
BICHROMATE OF POTASH

Mines in New Caledonia  
Plants at Baltimore and Jersey City  
Warehouse stocks carried in all principal cities.

## MUTUAL CHEMICAL CO. OF AMERICA

270 Madison Avenue, New York City



## NEW

RAPID & ACCURATE  
TEST SETS FOR  
BRASS & COPPER  
SOLUTIONS

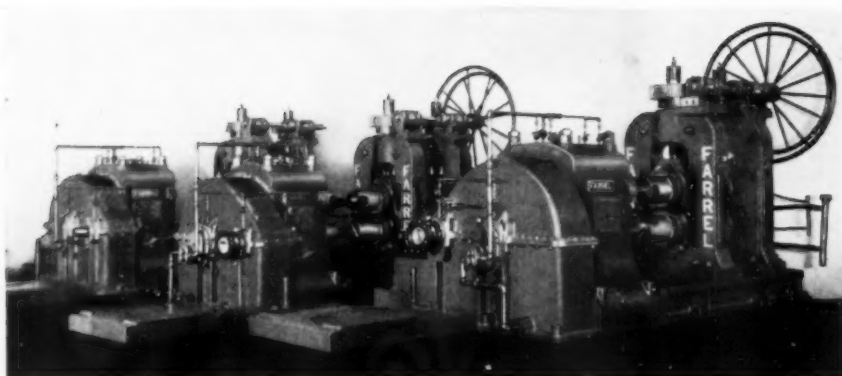
Write for leaflets

Testing Sets for Most  
Plating Solutions

Colorimetric, Quinhydrone  
& Glass Electrode Systems  
for pH

## KOCOUR CO.

4720 S. CHRISTIANA AVE.  
CHICAGO



## Rolling Copper Strip at 1000 feet per minute

The pressure of high labor costs and the shortened work week has intensified the search for increased output and lower production costs through improved mechanical equipment.

For the rolling of brass and copper strip Farrel has developed the high speed mill, which has stepped up the speed from the recent top of 250 feet per minute to 1000 feet per minute on copper and 750 feet per minute on brass.

Speeds as high as these require improved design and careful construction for maximum performance.

Farrel-Birmingham Rolling Mill Equipment includes: Rolls — Rolling Mills — Rod Mill Tables and Manipulating Equipment — Universal Mill Spindles — Rod Coilers — Lead Presses for Pipe or Rod — Roll Grinding Machines — Roll Calipers — Gears — Mill Pinions — Pinion Stands — Drives up to 10,000 H.P. — Flexible Couplings.

**FARREL-BIRMINGHAM**  
Company, Inc.  
201 Main St., Ansonia, Conn.

ance in continuous service. These qualities are built into Farrel Rolling Mills by advanced engineering, expert mechanics, modern plant facilities and a century of experience in building rolling mills and other heavy equipment.

Our engineers will be glad to explain the improved design and construction features of Farrel Rolling Mills which bring about higher operating efficiency, increased output, lower power consumption, minimum labor and maintenance costs and improved quality products.

## What the Reader Says

### Basket Plating Chromium

Editor, METAL INDUSTRY:

In your issue for May, on page 232, is an article on chromium plating. The article says nothing about the composition of the chromium plating bath. Would you be kind enough to give us the exact composition of this?

Can you give us any idea of the amount of chromium running to waste in the wash liquors following chromium plating? On the aggregate what would this amount to in the United States annually?

Madison, Wis.  
C. F. BURGESS LABORATORIES, INC.  
M. J. Shoemaker

In answer to your letter relative to chrom-

ium plating, in the article mentioned, the solution used was a standard sulphate solution, composition of

Chromic acid 55. oz./gal.  
Sulphuric acid .5 oz./gal.

Patents are held on this solution by United Chromium, Inc.

The amount of chromium running to waste in the wash liquor depends upon the amount and type of work being plated. The usual practice is to rinse the work in one or two still cold water rinses following chrome plating. These rinses are often used as replenishing solutions. In this manner the amount of chrome wasted is very small.

We are not in a position at the present time to submit an accurate estimate on

the annual waste of chromium in this manner.  
Morristown, N. J. E. F. INGERSOLL

## Preventing Rust from Perspiration

Editor, METAL INDUSTRY:

May I express my appreciation for your wonderful magazine. I receive practically every plater's paper printed on the face of the Globe, but none are as precise, complete or easy to digest as yours.

The purpose of this letter is to give a reply to the question on perspiration on page 371 of your August issue, just received.

To prevent perspiration on the hands, wash well in cold water and soap, rinse in cold running water and immerse in 25% solution of aluminum chloride in distilled water. This is the standard under-arm perspiration preventive. It should not be used on any other part of the body and only as often as needed. Usually once a day for three days and thereafter once or twice a week, is ample. Do not use on open sores or other parts just shaved.

Chicago, Ill.

LESLIE L. LINICK

## New Books

*Hot Dip Galvanizing Practice*, by W. H. Spowers, Jr. Published by Penton Publishing Co. Size 6 x 9, 203 pages; price \$4.00.

The author, who is a chemical and metallurgical engineer in consulting practice for some years in the field of galvanizing, has very opportunely brought between two covers, an up-to-date description of this industry at the time when there is no other book in print. He describes the problems of galvanizing and their solutions from the point of view of all the men involved in the operations—from the man at the kettle to the metallurgist and engineer.

The subjects covered include fluxing, dross recovery, kettle design, galvanizing of wire, pipe, sheet, stamped metal ware, boilers, etc. There is also a worth while discussion of pyrometry in hot galvanizing.

Added are 8 special drawings of furnace settings, layouts, etc. Also a 61-page bibliography.

*Minerals Yearbook 1938*. Published by the National Bureau of Mines. Obtainable from the Superintendent of Documents, Washington, D. C. Price \$2.00.

This standard yearbook comprises in 1339 pages, the only official record of mineral production in the United States, and the first and most complete review of the mineral industry in 1937. It presents a complete economic and statistical survey, giving current trends in production, consumption and prices, as well as technologic progress, world conditions and foreign trade in nearly 100 metal and mineral commodities.

## Manufacturers' Literature

*"Coming Problems Created by the Fair Labor Standards Act of 1938,"* by Allen W. Rucker and N. W. Pickering, president, Farrel-Birmingham Co., Inc., Ansonia, Conn.

*Inspected—Tested—and Approved.* Pemco clays especially made for use with porcelain enamels. The Porcelain Enamel & Mfg. Co., Pemco and Eastern Aves., Baltimore.

*Engineering Data on Tube Alloys.* Practical engineering data on tube alloys compiled by the Technical Department of the Driver-Harris Co., Harrison, N. J.

*Blast Gates.* Rockwell slide type blast gates; flanged butterfly type, etc. W. S. Rockwell Co., 50 Church St., New York.

*Chromium Plating: An Historical Survey.* Booklet 712; dealing with chromium plating from the very early stages up to the present day. W. Canning & Co. Ltd., Great Hampton St., Birmingham, 18, England.

*Abrasives. "Lionite: King of Abrasives."* General Abrasive Co., Inc., Niagara Falls.

*Band Sawing, Filing and Polishing Machine.* Continental Machine Specialties, 1301-7 Washington Ave., S., Minneapolis.

*High Lift Platform Trucks; Type "E-1."* Typical applications of the basic machine to the various industries by the use of correct attachments. Elwell-Parker Electric Co., Cleveland, Ohio.

*Thermo-Grips.* The "Ideal" line of electric soldering tools for better and quicker soldering. Ideal Commutator Dresser Co., 1231 Park Ave., Sycamore, Ill.

*Preparations for Standard Solutions.* DeHaen's Fixanal preparations. Terrill Belknap Marsh Associates, 480 Lexington Ave., N. Y.

*Presses; Bench Type, No. 101.* Bulletin 59-D. Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.

*Portable Electric Tools; Catalog No. 40.* For production, maintenance and construction. Skilsaw, Inc., 3310-20 Elston Ave., Chicago, Ill.

*"Is It Costing You Too Much to Heat Water?"* Demonstrations of inadequate piping, which may cause high fuel bills. Revere Copper & Brass, Inc., 230 Park Ave., New York.

*Design and Craftsmanship in Metals.* Bach Products, Inc., 620—5th Ave., N. Y.

*New Bonderizing Installation.* How the only Bonderizing plant on the West Coast devoted to the processing of steel windows effectively rust-proofs casement, monumental and industrial steel windows is interestingly described and illustrated in the July-August issue of Oakite News Service. A complete description of this recently completed installation is given, together with a concise outline of the function of the Bonderizing process in the manufacture of steel windows. Oakite Products, Inc., 14 Thames Street, New York, N. Y.

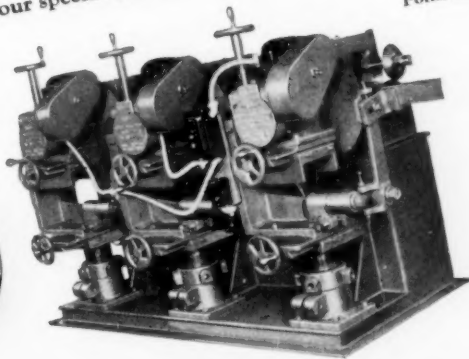
*Welding Aluminum and Its Alloys.* A revision which brings practice in this field up to date. Aluminum Co. of America, Pittsburgh, Pa.

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## Associations and Societies

### American Electro-Platers' Society

90 Maynard St., Springfield, Mass.

As noted in our August issue, George B. Hogaboom of the Hanson-Van Winkle-Munning Co., Matawan, N. J., has been appointed chairman of the A.E.S. Research Committee. The other members of this Committee are:

E. A. Anderson, New Jersey Zinc Co., Palmerton, Pa.

R. M. Wagner, Guide Lamp Div., General Motors Corp., Anderson, Ind.

F. Fulforth, Proctor Elec. Div., Proctor Schwartz Co., Philadelphia, Pa. (Home Address: Box 90, Roslyn, Pa.)

Carl E. Heussner, Chrysler Corp., Detroit, Mich.

B. H. McGar, Chase Brass & Copper Co., Waterbury, Conn.

Bert Sage, A. S. Campbell Co., E. Boston, Mass.

P. R. Pine, The Harshaw Chemical Co., Cleveland, Ohio.

G. Soderberg, The Udylyte Co., Detroit, Mich.

W. A. Wesley, International Nickel Co., Bayonne, N. J.

Charles Conley, National Cash Register Co., Dayton, Ohio.

Bernard C. Case, 44 King's College Pl., Stratford, Conn.

W. D. Rynkofs, Liberty Plating Co., Los Angeles, Calif.

Walter Meyer, General Electric Co., Bridgeport, Conn.

Austin Fletcher, Brewer-Tichenor Co., Binghamton, N. Y.

Frank K. Savage, C. G. Conn, Ltd., Elkhart, Ind.

James Hanlon, Chicago Plating Co., Chicago, Ill.

Nelson Sievering, Philip Sievering, Inc., New York City.

C. M. Hoff, E. I. DuPont de Nemours' Co., Electroplating Div., Wilmington, Dela.

Erwin Sohn, Standard Sanitary Mfg. Co., Louisville, Ky.

Wm. Blum, National Bureau of Standards, Washington, D. C.

Paul M. Savage, McGean Chemical Co., Cleveland, Ohio.

W. J. R. Kennedy, Secretary, A.E.S., Springfield, Mass.

Address all correspondence to Mr. Hogaboom at 557 Stanley St., New Britain, Conn.

The Joint Committee of the American Electro-Platers' Society, American Society for Testing Materials and the National Bureau of Standards is composed of:

#### A.E.S.

E. A. Anderson  
F. Fulforth  
George B. Hogaboom  
W. A. Wesley  
B. H. McGar

#### A.S.T.M.

J. C. Fox  
J. R. Freeman, Jr.

C. E. Heussner  
C. H. Sample  
Sam Tour

#### National Bureau of Standards

Dr. William Blum

#### Inspection

The next inspection of non-ferrous metal specimens and bright nickel on steel will be held at the Bell Telephone Laboratories, 463 West St., New York, Friday, Sept. 16, at 9:30 A.M. This will be followed by a Joint Committee conference at the same place. In the afternoon there will be a meeting of the Research Committee to discuss future plans for research work at the Bureau of Standards.

In the evening a meeting will be held of the Educational Committee of the International Conference in Asbury Park, N. J., in 1939.

On the following morning, Saturday, September 17, there will be an inspection of the specimens under exposure at Sandy Hook.

Horace Smith, general chairman of the A.E.S. 1939 International Conference invites all who attend a lunch at Berkley-Carteret Hotel, Asbury Park, to look over the Convention Hall and the meeting place for the convention.

#### Electrochemical Society

Dr. Colin G. Fink, Columbia University, New York City

The Electrochemical Society will hold its 74th Convention in the Hotel Seneca, Rochester, N. Y., on October 12th to 15th, 1938.

Among the papers scheduled for this meeting are the following:

*Anodic Behavior in Cyanide Copper Plating Baths*, by H. J. Read and Dr. A. Kenneth Graham.

*The Electrochemistry of Corrosion*, by R. H. Brown and R. B. Mears.

*Effect of Pressure on the Passivity of Various Metals*, by H. V. Tartar and C. A. Littler.

*Electrodeposition of Silver from Solutions of Silver Nitrate in the Presence of Addition Agents*, by R. Taft and L. H. Horsley.

*A Direct Method of Measuring Polarization on a Rotating Electrode and Its Application to the Study of Copper Deposition from Sulphate Solutions at High Current Densities*, by A. A. Boulach.

*A Theory of Cathodic Protection*, by R. B. Mears and R. H. Brown.

*Ammonia in the Electrodeposition of Brass*, by L. C. Pan.

*The Methacrylic Ester Resins*, by H. R. Dittmar, D. E. Strain and R. G. Kennelly.

*Brighteners in Silver Plating*, by B. Egeberg and N. E. Promisel.

*Silver Plating from Acid Complex Iodide Baths*, by D. K. Alpern and S. Toporek.

*Silver Membranes*, by H. J. Read and M. Kilpatrick.

#### Joint Meeting of American and British Institutes of Metals

At the invitation of the American Iron and Steel Institute and the American Institute of Mining and Metallurgical Engineers, a joint meeting will be held in the

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United States with the Institute of Metals of Great Britain, from October 3 to 25.

The meetings will begin on Monday, October 3rd with headquarters at the Hotel Waldorf-Astoria. The program includes technical sessions on metals, ferrous and non-ferrous, and visits to plants and laboratories in Naugatuck Valley, Conn., New York, Washington, D. C., Pittsburgh, Cleveland, Detroit, Buffalo and Chicago.

Full details can be obtained from the Institute of Metals Division, A.I.M.E., 29 W. 39th St., New York.

## American Foundrymen's Association

222 W. Adams St., Chicago, Ill.

### Fall Technical Conference

The Second Fall Technical Conference of the American Foundrymen's Association, on invitation from the University of Michigan, is to be held in the Michigan Union Building, Ann Arbor, Mich., September 15, 16 and 17.

This conference will be of the same type as that held at Battelle Memorial Institute last fall, and will be devoted to a discussion of the more technical phases of current foundry metallurgical interests.

Arrangements for the program are being developed by a committee composed of representatives of the A.F.A. Divisions, the University of Michigan and the Detroit A.F.A. Chapter, the chairman of the committee being Professor Richard Schneide- wind, Dept. of Metallurgical Engineering.

Also on the committee personnel is E. R. Darby, Federal-Mogul Corp., Detroit, representing A.F.A. Non-Ferrous Division.

**TECHNICAL SESSION—NON-FERROUS**  
Chairman, E. R. Darby, Federal-Mogul Corp., Detroit, Mich.

Subject: Age Hardening

*A Description of the Age Hardening Process as Applied to Castings*, L. W. Kempf, Aluminum Company of America, Cleveland, O.

*High Conductivity, Age Hardening, Copper-Chromium Alloys*, Dr. A. B. Kinzel, Union Carbide & Carbon Research Laboratories, New York, N. Y.

## Electrotypers & Stereotypers

Plans are nearing completion for the 41st Annual Convention of the International Association of Electrotypers & Stereotypers, which is to be held at the Hotel Statler, Boston, Mass., September 21-23. Host at this occasion will be the New England Electrotypers Association, with headquarters in Boston.

The program will be of educational value to all with outstanding speakers on subjects of real and vital interest. The Annual Banquet will be on the evening of Thursday, September 22. Many enjoyable events are being planned for the ladies.

Dennis F. Hoynes of the Central Electrotype Co., Cleveland, is President of the Association and Albert E. Benson is Managing Director, with offices in Cleveland.

## Personals

J. R. Freeman, Jr., has been appointed Technical Manager of the American Brass Company, Waterbury, Conn., to succeed the late H. C. Jennison. Mr. Freeman has been on the technical staff of the company for a number of years following a period of service with the National Bureau of Standards. He is a member of a number of tech-



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nical societies including the Institute of Metals Division, A.I.M.E., and the American Society for Testing Materials, and has always been active for committee work in those organizations.

*J. H. Goss*, has been appointed president and general manager of the *Scovill Mfg. Company*, Waterbury, Conn., succeeding the late *Edward O. Goss*.

*Edward S. Coe, Jr.*, has been transferred from the Buffalo plant of the *Farrel-Birmingham Company*, Ansonia, Conn., to the branch sales office, located in 1059 First National Bank Bldg., Chicago, Ill.

*William H. France*, formerly of the *Audiffren Refrigerating Machine Co.*, Providence, R. I., has been made executive vice-president and general manager of the *American District Steam Co.*, North Tonawanda, N. Y. He will supervise manufacture and sale of new products still in the development stage, in addition to supervision of the present lines of fittings produced by this company with 60 years' experience behind them.

*A. L. Petersen* has been appointed by *Joseph T. Ryerson & Son, Inc.*, as manager of their St. Louis plant. Mr. Petersen is an engineering graduate of *Armour Institute of Technology* at Chicago. He has been with the *Ryerson* company for 25 years and has had wide experience in practically every department of the business, working successively in the billing, auditing, purchasing and sales departments at Chi-

cago. After a period of war service he returned to the Detroit plant. For some time, Mr. Petersen has been assistant manager of the St. Louis plant.

*R. E. Taylor* has been appointed sales research manager by the *Norton Co.*, Worcester, Mass. He succeeds *Milton P. Higgins*, transferred to the Chippawa plant.

*R. G. Wyld* has been appointed vice-president in charge of engineering for *Airtemp, Inc.*, Detroit, Mich., the air-conditioning subsidiary of the Chrysler Corp. He was formerly executive engineer.

*L. P. Sperry* has been appointed executive vice-president and treasurer of the *Scovill Mfg. Company*, Waterbury, Conn.

## Obituaries

### Herbert C. Jennison

Herbert C. Jennison, Technical Manager of The American Brass Company, Waterbury, Conn., died after a short illness June 12th at his home, Brooklawn Park Hills, Bridgeport, Connecticut.

Mr. Jennison had been connected with The American Brass Company since 1900—first as Laboratory Assistant, then as Testing Engineer. From 1919 to 1923 he was Technical Supervisor of the Ansonia Branch of The American Brass Company and in 1923 came to Waterbury as Technical Superintendent. In 1934 Mr. Jennison was appointed Technical Manager, which position he held at the time of his death.

Mr. Jennison's early education was obtained in the schools of Bridgeport, Connecticut, this being supplemented by active

outside studies. As a part of his activities with The American Brass Company he was concerned with the work of numerous technical committees of national engineering societies, particularly those in the non-ferrous field, such as copper and copper alloy wires and non-ferrous metals and alloys for the American Society for Testing Materials. He was also a member of the Joint Committee on Trolley Wire Specifications and was a member of the Non-Ferrous Metals Division of the Society of Automotive Engineers.

Mr. Jennison was a member of the Metallurgical Advisory Board of the Army Ordnance Department and the Metallurgical Advisory Board of the U. S. Bureau of Standards, Washington, D. C. He held membership in the American Society for Testing Materials, American Institute of

### Watch for the Coming Issues of METAL INDUSTRY!

October is one of the important months of the year for us. In this issue will be the Pre-Convention Advance Information article on the Annual Metal Show, containing full details about the technical program and exhibits of interest to metal products manufacturing and metal finishing.

Other articles also of prime interest:

*Notes on Metal Finishes.* Methods and solutions used to plate and finish samples exhibited by the Branches of the American Electro-Platers' Society at their recent convention.

*Manufacturing High Grade Brass and Bronze Valves and Fittings,* by Francis A. Westbrook.

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HERBERT C. JENNISON

Mining & Metallurgical Engineers, British Institute of Metals, American Institute of Electrical Engineers and the Electro-Chemical Society.

Mr. Jennison is survived by a sister, Miss Helen E. Jennison of Bridgeport, Connecticut.

## Frank M. Bauer

Frank M. Bauer passed away at his residence, 419 Beach 122nd St., Rockaway Park, Long Island, Wednesday morning, July 20th, 1938.

Mr. Bauer, the son of Jacob Bauer and Emma Bauer, nee Helck, was born in 1876. Mr. Bauer entered business in 1900 with Henry Pfaltz, forming the firm of Pfaltz & Bauer, Inc., importers of chemicals, scientific instruments and laboratory apparatus. Steadily growing, the firm became an important factor in supplying equipment to American universities and industrial concerns. Mr. Bauer was also president and director of Calny Realty Corporation and the Coast Realty Corporation.

Active in civic and industrial affairs Mr. Bauer was a member of the Masonic Club of N. Y., the Square Club, Shriners, Queensboro Lodge, B. P. O. E., Columbia Yacht Club, N. Y. Board of Trade, Drug & Chemical Club, Empire State Club and the Rockaway Civic Club.

Mr. Bauer is survived by his wife, Edna Warner Bauer.

The business of Pfaltz & Bauer, Inc., will continue as heretofore being managed by the officers of the corporation, all of whom have been associated with the firm for many years.

## Leopold C. Gosselin

Leopold C. Gosselin, president of the New York Nickel Plating & Mfg. Co., 327 E. 63rd St., New York City, with which he had been associated since 1898, died August 24 in his home, 41-15-75th St., Jackson Heights, Queens, N. Y., of heart disease. Mr. Gosselin was 70 years old. He had been secretary of the New York division of the Travelers Protective Association for the last forty years. Surviving are his widow, a daughter, two sons, Leopold and Maurice, and a sister.

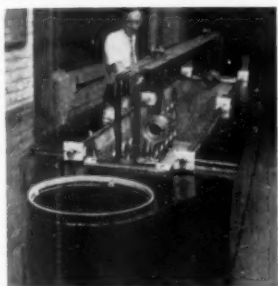
## John F. Nonamaker

John F. Nonamaker of the Zapon Division, Atlas Powder Co., 333 Hudson St., New York, died at his home in Woodhaven, L. I., on August 19th, at the age of 54. He had been connected with Zapon since 1922 as a sales representative, attached to the Metropolitan New York office.

A veteran in the lacquer industry, he leaves a wide circle of friends and associates to mourn his passing.

## Samuel J. Sizelove

Samuel J. Sizelove, 82, father of Oliver J. Sizelove of the Frederick Gumm Chemical Co. Inc., Kearny, N. J. died suddenly



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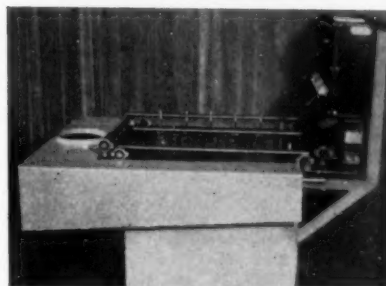
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while on a camping trip early in August, of heart failure. He was a resident of Pittsfield, Ill.

Mr. Sizelove is survived by his widow, Mrs. Maria Coats Sizelove, and his one son, Oliver J. Sizelove, who is widely known to METAL INDUSTRY readers. Our sympathy

goes out to Mr. Oliver. Sizelove in his bereavement.

### Henry Kramer

Henry Kramer, founder and head of H. Kramer & Company, Chicago, Ill., makers of brass ingot, died August 11, aged 83.

## Verified Business Items

Beardsley & Piper Co., 2541 N. Keeler Ave., Chicago, Ill., has adopted a novel method of selling its new sand preparation machine, the Speedmullor, that uses rubber mulling balls. Mounted on a modern streamlined truck, this machine is run into a foundry and in a few minutes is set up and ready to give a demonstration on how to properly prepare sand. Fitted with a skip hoist on the rear end of the truck, the Speedmullor is loaded from the foundry floor, the sand conditioned and discharged.

Frank D. Newbury has been appointed manager of the New Products Division of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., as successor to Herbert Mygatt Wilcox who died July 28. In addition to this development of activities for Westinghouse in new fields, Mr. Newbury will continue his present duties as Economist for the company.

J. J. Siefen Co., announce their removal from 1936 W. Lafayette Blvd., Detroit, Mich., to 5657 Lauderdale St., Detroit.

International Nickel Co., 15 Oak St., Bayonne, N. J., has awarded contract for three additions to its laboratory, 1 story 25 x 50 ft., 55 x 145 ft. and 50 x 60 ft. Estimated cost \$200,000.

General Refractories Co., Philadelphia, Pa., has appointed the following as distributors: Slip Not Belting Co., Kingsport, Tenn.; Fleck Co., Camden, N. J.; New England Brick Co., Boston, Mass.; Lusco Brick & Stone Co., Kansas City, Kan.

Metalfield Inc., 43-01—22nd St., L. I. City, N. Y., has leased the former three-story factory of Russell Playing Card Co., Milltown, N. J. The plant affords about 82,000 sq. ft. of floor space. The company, which manufactures metal products will be moved to the new location where production will be increased. Departments operated: drawing, stamping, polishing, degreasing, cleaning, plating, tumbling, buffing, coloring, lacquering, enameling, finishing. Principal base metals used: brass, steel, bronze, nickel silver, aluminum.

Brewster Aeronautical Corp., 27-01 Bridge Plaza, N., L. I. City, N. Y., manufacturer of aircraft equipment, has organized a new division, Brewster Aircraft Parts, for production of airplane parts. P. M. Stephenson, production manager for parent company, will be vice-president. Departments interested in: cleaning, plating, anodic treatment, finishing. Principal base metals used: steel, aluminum.

Charles H. Keeney, general manager of Connecticut Blower Co., Hartford, Conn., announces the opening of a New York office at 155 E. 44th St. with J. G. Stalb as District Manager to cover New York City, southern New York State, Long Island, New Jersey and Delaware. This company also announces 5 additional sales engineers as follows. Carl E. Swift, Holland, Mich., for the state of Michigan; J. P. Gilboy, Scranton, Pa., for the state of Pennsylvania; M. E. Marsalis, Ft. Worth, Texas, for the state of Texas; C. E. Kreipke, Evansville, Ind., for the state of Indiana and C. J. Scanlon, Bloomington, Ill., for the state of Illinois.

Magnus Chemical Company, Inc., Garwood, N. J., announces three appointments to its sales department. Raymond D. Kennedy becomes a resident sales representative in Philadelphia, Pa. William F. Newton will represent Magnus in California. Douglas L. Foster will represent Magnus in western New York State. Magnus Chemical Company is the manufacturer of cleaning materials, industrial soaps, metallic soaps, sulfonated oils, emulsifying agents and metal working lubricants.

C. H. McAleer, president, announces several changes in the officers and directors of the McAleer Manufacturing Company, 2431 Scotten Ave., Detroit, Mich. Louis F. Davis, formerly of Philco Radio and Television Corporation and Kroger Grocery & Baking Co., who was elected vice-president and treasurer, will act as general manager. A. H. Regener continues as secretary of the company as well as credit manager. A. G. Neubauer is in charge of sales to the distributors.

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C. J. Kennedy is in charge of sales to manufacturers. F. A. Weihe, Jr. is factory manager and Ernest Hummitch, purchasing agent and advertising manager. The new board of directors is composed of the officers of the company and E. S. Finch of New York City and R. William Rogers of the firm Bulkley, Ledyard, Dickinson and Wright, attorneys for the company. Coincident with these changes Mr. McAleer is able to report a very satisfactory profit for the second quarter compared to a first quarter loss of \$30,726.27. Prospects for the third and last quarter are especially encouraging as the company derives considerable volume from the automotive industry.

Globe American Corp., Kokomo, Ind., has resumed production after a lay-off of three months and will provide employment for about 250 men. This company manufactures heating and cooking stoves using coal, wood, gas and electricity for fuel.—H. S.

Dirilyte has taken its place in the trade name list, filling the vacancy created by the passing out of Dirigold in compliance with a recent order by the Federal Trade Commission. The change has been announced by John P. Fredrick, president-treasurer of the American Art Alloys, Inc., Kokomo, Ind., where the product is manufactured. Mr. Fredrick stated that Dirilyte is superior to Dirigold, being even less liable to tarnishing.—H. S.

Farrel-Birmingham Co., Inc., Ansonia, Conn., has begun construction of an additional foundry building with 4,000 sq. ft. floor space. Included in the new equipment to be installed is a 15-ton traveling crane, a large molding machine and a modern sand handling system for the elimination of dust and reclamation of sand from molds used in the Randupson process.

Metallizing Co. of America, Inc., 1351 E. 17th St., Los Angeles, Calif., has changed its distributor policy and beginning Sept. 1, all sales and service will be handled direct by factory branches. The New York and Chicago offices have been consolidated into a central office at 562 W. Washington, Chicago, Ill. All welders are invited to visit the Instruction Department which will be in charge of E. T. Parkinson, formerly manager of the company's San Francisco office. Supervising all Eastern activities will be L. E. Kunkler, president and V. A. Cook, vice-president, with offices at the above Chicago address.

### Instrumentation Contest

An instrumentation contest with a first prize of \$200 in cash is announced by the Industrial Instrument Section of Scientific Apparatus Makers of America.

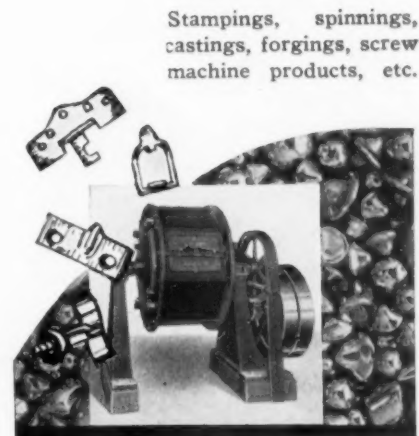
Twelve prizes in all, totalling \$500 will be awarded by the Apparatus Makers. The contest is open to any engineer or operating man, not employed by an instrument manufacturer. Each contestant is to write about an unusual application of a standard instrument or control device, telling briefly what conditions or need impelled the application. By instrument or control device is meant

## FINISH SMALL PARTS

*at a profit*

Have you all the facts about ball burnishing? Facts uncovered in a demonstration on your own small metal parts? Such an experiment is frequently the first step toward making production pay extra profits. If you're unfamiliar with burnishing, developing a new product, or not getting satisfactory results from present equipment, send us a few unfinished samples. After the experiment we'll show you why high and narrow Abbott barrels assure fast production, uniform lustre, negligible unit finishing cost. Worth investigating, isn't it? The Abbott Ball Company, 1046 New Britain Avenue, Hartford Connecticut.

**ABBOTT**  
BALL BURNISHING



Stampings, spinnings, castings, forgings, screw machine products, etc.

**Agateen LACQUERS**

All types  
of  
Clear Lacquer  
for Metals

## BUFFING LACQUER

for Cloisonne Reproductions

Air-Dry Priming Lacquer

Water Dip Lacquer

Elastic

Non-blushing

Agate Lacquer Mfg. Co., Inc.

11-13 Forty-third Road, LONG ISLAND CITY, N. Y.

**Agateen** —The Last Word in Quality



## THE MEASURE OF WORTH

"All works of taste must bear a price in proportion to the skill, time, expense and risk attending their invention and manufacture. Those things called dear are, when justly estimated, the cheapest . . . . ."

"Beautiful forms and compositions are not made by chance . . . A composition for cheapness and not for excellence of workmanship is the most frequent and certain cause of the rapid decay and entire destruction of arts and manufacture."—Ruskin.

### ON THIS BASIS WE OFFER

MATCHLESS HIGH GRADE BUFFS

BUFFING COMPOSITIONS, POLISHING WHEELS

There is no substitute for "MATCHLESS"

**The Matchless Metal Polish Co.**

840 W. 49th Pl., Chicago, Ill.

726 Bloomfield Ave., Glen Ridge, N. J.



Trade Mark Reg.  
U. S. Pat. Office

## QUALITY BUFFS FOR ALL TYPES OF WORK

For Years SPEEDIE Quality Buffs And Polishing Wheels Have Been The Old Reliable In Job And Production Shops.

Buffers Have Found SPEEDIE Quality Buffs Superior For Their Work and Economical To Use With A Smooth, Even, Uniform Finish On Every Job.

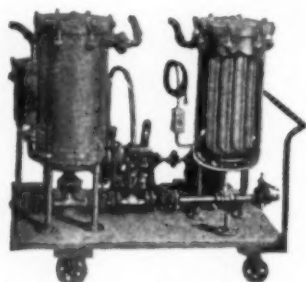
Sold By The Manufacturers Of

SPEEDIE BUFFING & POLISHING COMPOSITIONS

**THE BUCKEYE PRODUCTS CO.**

Cincinnati, Ohio

## PRESSURE FILTERS—for . . . PLATING SOLUTIONS CLEANERS, NEUTRALIZING SOLUTION, DEGREASING SOLVENTS, ETC.



Cut illustrates closed & internal view of filter.

### INDUSTRIAL FILTERS OFFER— PERFECT CLARITY AT RATED CAPACITIES—\*Guaranteed\*

**CLOSED FILTRATION**—Filter plates locked in leak proof chamber, which means "no leaking"—"no lost solution."

**LARGE FILTER CHAMBER**—Affords greater sludge holding capacity making ideal system for removal of carbon or lime from treated solutions in process of eliminating iron, organic matter, oil, etc.

Write for literature including specifications on filters for  
**HOT & BRITE NICKEL, BRITE ZINC, CHROMIUM & ELECTROCOLOR.**

**INDUSTRIAL FILTER & PUMP MFG. CO.**  
3017 W. Carroll Ave. Chicago, Ill.



# CLEPO



This name in your plating room assures you of a perfect adhesion in your plating cycle.

**CLEPO**—the ultimate in cleaning efficiency.

**CLEPO** heads the specification list of many of the nation's largest manufacturers.

Our Laboratory's spectacular new developments are adding new customers daily to our long list of satisfied users.

Drop a line if you have any plating problem and we will have one of our experts call upon you.

**FREDERICK GUMM CHEMICAL CO., Inc.**  
538 Forest St., Kearny, N. J.

any device used for measurement or control in a plant or laboratory, or any accessory used with a device for measurement and control.

The contest closes November 15, 1938, and the judging will be held during the week of December 5th. Copies of the contest rules and official entry form can be obtained from the Scientific Apparatus Makers of America, 20 N. Wacker Drive, R. 3014, Chicago, Ill.

## Nickel Cargo Tanks

An interesting use of Nickel is exemplified in the twin screw Diesel Ship Dolomite IV, built for bulk transportation of caustic soda and other highly corrosive chemicals along the Atlantic Seaboard. The Dolomite IV has five main bulkhead cargo tanks lined with sheet nickel. Although tank trucks and tank cars have been constructed of nickel clad steel and fishing boats are now being built with nickel lined holds to bring fresh fish in from the Atlantic, the Dolomite IV is said to be the first freight ship to feature nickel cargo tanks.

## Metal Market Review

August 25, 1938

**Copper** rested and consolidated its gains during the past five weeks, after its leap upward of the previous month. Domestic copper was last quoted here at 10c per lb. electrolytic delivered Connecticut Valley. On July 29th it was advanced to 10½c where it still remains. Export copper has fluctuated somewhat but has on the whole, been firm; most of the time slightly above domestic but at this writing, a few points below, 10.05c. Sales week by week were 20,322 tons; 12,822; 5,676; 4,618 and 3,754 tons making a total of 47,192 tons against 166,365 tons for previous five weeks. Sales for July totalled 124,054 tons compared with 90,978 tons in June. Stocks of refined foreign and domestic copper showed a reduction of 28,299 tons in July. About 19,000 tons of this reduction took place in the United States and about 9,000 abroad. At this time the domestic price is firm and export copper is fluctuating.

**Zinc** also stood pat after its jump in July, remaining at 4.75c per lb. Prime Western E. St. Louis. July statistics were encouraging showing a decrease of 3,463 tons in stocks of metal in the hands of producers, the first decrease recorded since August 1937. Unfilled orders at the end of July amounted to 39,350 tons compared with 41,785 tons in June.

Present situation, quiet but not unsteady as galvanizers are operating at about 50% capacity against 35% a month ago.

**Cadmium** was reduced to 75c-\$1.05 per lb. from 85c-\$1.20.

**Tin** experienced a quiet month. Prices fluctuated very little ranging mostly between 43 and 44c per lb. Straits, N. Y. Present figure, 43.60. Although foreign observers ex-

pect improvement in the consumption of tin in the United States during the Fall and perhaps higher prices, inventories of tinplate are still ample for current operations (about 30% of capacity). World visible stocks of tin increased in July by 1,935 tons to a total of 29,447 tons.

Lead was unchanged from the peak of the previous month still selling at 4.75c per lb. E. St. Louis. Sales were fair: 8,076 tons; 6,190; 3,079; 2,600 and 3,460, making a total of 23,405 tons compared with 38,877 tons in the previous five weeks. Stocks of refined lead were off 9,100 tons in July compared with a drop of 377 tons in June.

The present situation would be firm if there were less apprehension about conditions abroad. Consumption here continues on a fair basis.

Silver was unchanged remaining at 42 $\frac{3}{4}$ c per oz. Troy, New York official, although some speculation took place in London. The tendency remains steady.

Platinum hopped \$3 per oz. to \$36-39.

Scrap Metals veered with foreign winds. Copper and brass edged upward for a couple of weeks and then ceased. Secondary aluminum was generally firm and higher. Brass ingot call was steady for a while but has recently slipped back.

On August 1st unfilled orders on the books of the members of the Non-Ferrous Ingot Metal Institute amounted to 17,466 net tons against 15,864 on July 1st.

Combined deliveries of brass and bronze ingots and billets for members during the month of July amounted to 3,936 tons compared with 3,800 tons in June.

The Institute reports the average prices per pound received by its membership on commercial grades of six principal mixtures of ingot brass and bronze during the twenty-eight day period ending August 5.

	4 wks. end. Aug. 5	4 wks. end. July 8
80-10-10 .....	11.940	10.828
78% Metal .....	9.329	8.254
81% Metal .....	9.500	8.515
83% Metal .....	9.996	8.838
85% Metal .....	10.301	9.070
No. 1 Yellow .....	8.636	7.583

#### Average Prices for Metals

	July
COPPER c/lb. Duty 4c/lb.	
LAKE (del. Conn. Producers' Prices) .....	9.872
ELECTROLYTIC (del. Conn. Producers' Prices) .....	9.810
CASTING (f.o.b. ref.) .....	9.337
ZINC (f.o.b. E. St. Louis) c/lb.	
Duty 1 $\frac{3}{4}$ c/lb.	
Prime Western (for Brass Special add 0.10) .....	4.75
TIN (f.o.b. N. Y.) c/lb. Duty Free, Straits .....	43.366
LEAD (f.o.b. St. L.) c/lb. Duty 2 $\frac{1}{2}$ c/lb. ....	4.732
ALUMINUM c/lb. Duty 4 c/lb. ....	20.000
NICKEL c/lb. Duty 3 c/lb. Electrolytic 99.9% .....	35.000
ANTIMONY (Ch.) c/lb. Duty 2 c/lb. ....	14.00
SILVER c/oz. Troy, Duty Free ....	42.75
PLATINUM \$/oz. Troy, Duty Free ..	34.50
GOLD—Official U. S. Treasury Price	35.000

## "PRODUCTION SAVINGS NEARLY HALF"



NEW BOOKLET ON AMERICAN BONDED METALS SHOWS HOW YOU, TOO, CAN SAVE—WRITE NOW FOR FREE COPY

PRE-FINISHED American Bonded Metals for modern design—for big production economies. Our interesting and valuable new booklet gives full details and illustrates many outstanding examples. Write for it now—no cost or obligation.

**AMERICAN NICKELOID COMPANY**  
8 SECOND STREET, PERU, ILLINOIS  
Sales Offices in All Principal Cities

# 1617

Reg. U. S. Pat. Off.

## Truth Will Out!

A few months ago we received a request from a large eastern manufacturer for a sample of Non-Spotting Lacquer. For years he had told us his present material was good enough. Today he is a steady user of 1617 Clear Metal Lacquer.

Again the claims made for this Quality lacquer and its Non-Spotting characteristics have been proven.

The spotting out of finishes on cast metals and the crystal spotting of oxidized finishes will be reduced and possibly eliminated by the use of 1617—the Original Non-Spotting Lacquer.

**TRY 1617 THIS SUMMER**—when due to heat and humidity spotting out is most prevalent.



## THE STANLEY CHEMICAL COMPANY

EAST BERLIN, CONN.

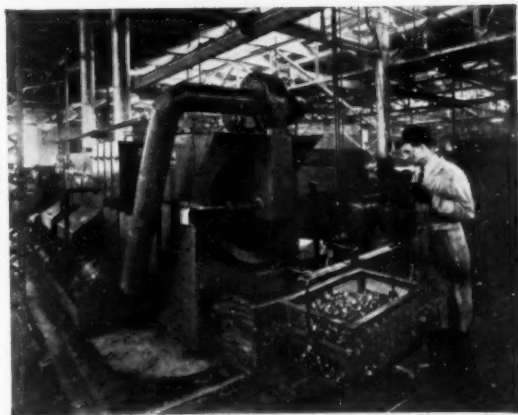
Lacquers • Synthetics • Enamels • Japans

A Subsidiary of THE STANLEY WORKS, New Britain, Connecticut



## Serving SERVEL

"—washing, rinsing and drying small stampings and screw machine parts as cheaply as any method that could be devised." C. H. Sullivan, Process Engineer, Servel, Inc.



This is a standard model but may be altered in detail to solve particular cleaning problems. No matter what you have to wash, rinse, dry, tumble or burnish, put your problem up to us.

Put it up to Specialists

**N. Ransohoff Inc.**

We also make sawdust tumbling, plating, pickling, burnishing and separating machinery.

West 71st St. at Millcreek, Carthage, Cincinnati, O.

# Supply Prices, August 25, 1938

## Anodes

Prices, except silver, are per lb. f.o.b., shipping point, based on purchases of 2,000 lbs. or more, and subject to changes due to fluctuating metal markets.

COPPER: Cast	19 3/4 c. per lb.	NICKEL: 90-92%, 16" and over	.45 per lb.
Electrolytic, full size, 14 3/4 c.; cut to size	14 3/4 c. per lb.	95-97%, 16" " "	.46 per lb.
Rolled oval, straight, 15 1/4 c.; curved	16 1/4 c. per lb.	99% + cast, 16" and over, 47 c.; rolled, depolarized, 16" and over, 48.	
BRASS: Cast	18 3/4 c. per lb.	SILVER: Rolled silver anodes .999 fine were quoted Aug. 25, from	
ZINC: Cast	10 c. per lb.	46 c. per Troy ounce upward, depending on quantity.	

## White Spanish Felt Polishing Wheels

Diameter	Thickness				
	Under 1/2"	1/2-15/16"	1-2"	2-3 1/2"	Over 3 1/2"
Under 1"	6.35-6.40	6.20-6.25	6.10-6.15	6.10-6.15	6.35-6.40
1" to 1 7/16"	5.85	5.70	5.60	5.60	5.85
1 1/2" to 3 15/16"	5.55	5.35-5.40	5.30-5.35	5.30-5.35	5.60
4-5 15/16"	4.95-5.00	4.70-4.85	4.65-4.75	4.65-4.75	4.95-5.00
6", 8" & 9"	3.80-4.25	3.45-3.95	2.45-3.05	2.45-3.00	2.90-3.35
10" to 18"	3.80-4.25	3.45-3.95	2.45-2.95	2.45-2.85	2.90-3.25
Over 18"	3.80-4.25	3.45-3.95	2.70-3.05	2.70-3.00	2.90-3.35

Prices above are for less than 50 lb. For over 50 lbs. various discounts or deductions are allowed.

On grey Mexican wheels deduct 10c per lb. from above prices.

## Cotton Buffs

Full disc open buffs, per 100 sections when purchased in lots of 100 or less are quoted:

16" 20 ply 84/92 Unbleached	\$75.24
14" 20 ply 84/92 Unbleached	57.67
12" 20 ply 84/92 Unbleached	43.28
16" 20 ply 80/92 Unbleached	63.28
14" 20 ply 80/92 Unbleached	48.57
12" 20 ply 80/92 Unbleached	36.52
16" 20 ply 64/68 Unbleached	59.69
14" 20 ply 64/68 Unbleached	45.84
12" 20 ply 64/68 Unbleached	34.49

3/8" Sewed Buffs, per lb., bleached or unbleached 54c to 90c

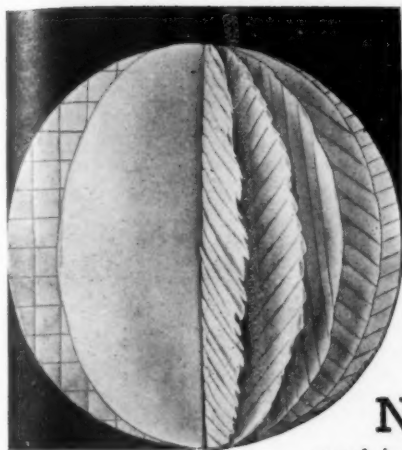
## Chemicals

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone C. P. l.c.l. Drums	lb.	.06 1/4	Lead—Acetate (Sugar of Lead), bbls.	lb.	.10-.12 1/2
Acid—Boric (Boracic) granular, 99 1/2% + % ton lots	lb.	.054-.059	Oxide (Litharge), bbls.	lb.	.12 1/2
Chromic, 100 lb. and 400 lb. drums	lb.	.16 3/4-.17 1/4	Lime Compositions for Nickel	lb.	.09 1/2-.11
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.027	Lime Compositions for Brass	lb.	.09 1/2-.11
Hydrochloric, C. P., 20 deg., carboys	lb.	.08	Mercury Bichloride (Corrosive Sublimate)	lb.	\$1.58
Hydrofluoric, 30%, bbls.	lb.	.07-.08	Methanol, (Wood Alcohol) Pure, drums l.c.l.	gal.	.40 1/2
Nitric, 36 deg., carboys	lb.	.06	Nickel—Carbonate, dry bbls.	lb.	.36-.41
Nitric, 42 deg., carboys	lb.	.07 1/2	Chloride, bbls.	lb.	.18-.22
Sulphuric, 66 deg., carboys	lb.	.02 1/2	Salts, single, 425 lb. bbls.	lb.	.13 1/2-.14 1/2
Alcohol—Butyl, drums (f.o.b. destination)	lb.	.09 1/2-.10	Salts, double, 425 lb. bbls.	lb.	.13 1/2-.14 1/2
Alum—Lump, barrels	lb.	.0340-.0365	Paraffin	lb.	.05-.06
Powdered, barrels	lb.	.0355-.0380	Phosphorus—Duty free, according to quantity	lb.	.35-.40
Ammonia, aqua, com'l., 26 deg., drums, carboys	lb.	.02 1/2-.05 1/4	Potash Caustic Electrolytic 88-92% broken, drums	lb.	.07 1/4-.08 1/2
Ammonium—Sulphate, tech., bbls.	lb.	.03 1/2-.05	Potassium—Bichromate, casks (crystals)	lb.	.09 1/4
Sulphocyanide, technical crystals, kegs	lb.	.55-.58	Carbonate, 98-100%	lb.	.06 1/2
Arsenic, white kegs	lb.	.04 1/2-.05	Cyanide, 165 lbs. cases, 94-96%	lb.	.52 1/2
Asphaltum, powder, kegs	lb.	.23-.41	Pumice, ground, bbls.	lb.	.03
Benzol, pure, drums	gal.	.41	Quartz, powdered	ton	\$30.00
Borax, granular, 99 1/2% + %, ton lots	lb.	.027-.032	Rosin, bbls.	lb.	.04 1/2
Cadmium oxide, 50 to 1,000 lbs.	lb.	1.20	Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.05-.07 1/2
Calcium Carbonate (Precipitated Chalk), U. S. P.	lb.	.05 3/4-.07 1/2	*Silver—Chloride, dry, 100 oz. lots	oz.	.40 1/4
Carbon Bisulphide, drums	lb.	.05 1/4-.06	Cyanide, 100 oz. lots	oz.	.43
Chrome, Green, commercial, bbls.	lb.	.22	Nitrate, 100 ounce lots	oz.	.35
Chromic Sulphate, drums	lb.	.26 1/4	Soda Ash, 58%, bbls.	lb.	.0235
*Copper—Acetate (Verdigris)	lb.	.25	Sodium—Cyanide, 96% minimum, 100 lb. drums	lb.	.15
Carbonate, 53/55% cu., bbls.	lb.	.15 1/2	Hyposulphite, kegs, bbls.	lb.	.03 1/2-.06 1/4
Cyanide (100 lb. kgs.)	lb.	.34	Metasilicate, granular, bbls.	lb.	3.15
Sulphate, tech., crystals, bbls.	lb.	.0495	Nitrate, tech., bbls.	lb.	.029
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.20 1/4-.20 1/2	Phosphate, tribasic, tech., bbls.	lb.	.03
Crocus Martis (Iron Oxide) red, tech., kegs	lb.	.07	Silicate (Water Glass), bbls.	lb.	.01 1/4
Dextrin, yellow, kegs	lb.	.05-.08	*Stannate, drums	lb.	.30-.32
Emery Flour (Turkish)	lb.	.07	Sulphocyanide, drums	lb.	.30-.35
Flint, powdered	ton	30.00	Sulphur (Brimstone), bbls.	lb.	.02 1/4
Fluorspar, bags	lb.	.03 1/2	*Tin Chloride, 100 lb. kegs	lb.	.35 1/2
*Gold Chloride	oz.	\$18 1/4-.23	Tripoli, powdered	lb.	.03
*Gold Cyanide, Potassium 41%	lb.	\$15.45	Trisodium Phosphate—see Sodium Phosphate.		
*Gold Cyanide, Sodium 46%	lb.	\$17.10	Wax—Bees, white, ref. bleached	lb.	.60
Gum—Sandarac, prime, bags	lb.	.50	Yellow, No. 1	lb.	.45
Shellac, various grades and quantities	lb.	.31	White Silica Compositions for Brass	lb.	.07 1/2-.10
Iron Sulphate (Copperas), bbls.	lb.	.16	Whiting, Bolted	lb.	.02 1/2-.06
			Zinc—Carbonate, bbls.	lb.	.13
			Cyanide (100 lb. kegs)	lb.	.33
			Chloride, drums, bbls.	lb.	.065
			Sulphate, bbls.	lb.	.04

\* Subject to fluctuations in metal prices.

Metal Prices on page 458.

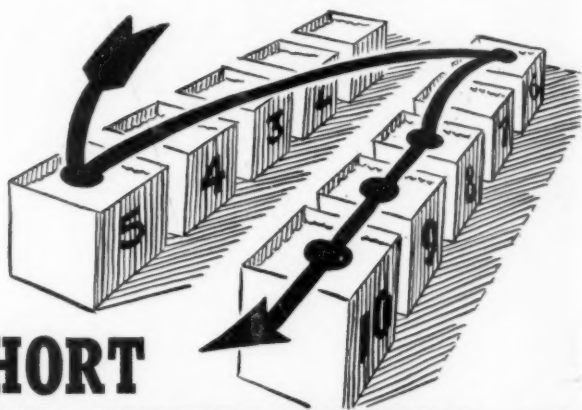


## Make A Shop Test Of Yerges Buffs

**N**O OTHER buff gives such economy and speed in all cutting and buffing operations as a Yerges buff because no other buff is designed and made in the same way. The square-stitched, pleated sections of special muslin are bias-cut and each piece is laid at a specified angle to the next piece. Pockets automatically form at the edge as the buff wears, holding and saving abrasive.

Yerges buffs are available for a wide variety of work, from the softest buffing to the hardest cutting. Let us send you samples and data. The Yerges Mfg. Company, Fremont, Ohio.

# YERGES



## SHORT CUT WITH METSO 66

**LEADING PLATING SHOPS** make savings with Metso 66 that can be measured. Because of its faster, complete cleaning action, the number of baths often can be reduced. In one large plant Metso 66 eliminated *five* different operations in the cleaning sequence.

Besides, Metso 66 comes ready for use, no rosin to add. You'll find this convenient and time saving. For test samples and further information, get in touch with us.



**PHILADELPHIA QUARTZ CO.**

General Offices & Laboratory: 125 S. Third St., Phila., Pa.  
Chicago Sales Office: 205 W. Wacker Drive. Stocks in 60 cities.

## METSO CLEANERS

METAL INDUSTRY, September, 1938

# Besplate

## NICKEL ANODES

## ARE QUALITY PRODUCTS . . .

**LEADERS** in the Nickel Plating Industry have standardized on McGean Besplate 99% Nickel Anodes — Because

1. Cathode Deposits are smoother
2. Anode corrosion is excellent
3. Less frequent filtering of solution required



We Also Offer

Genuine Rolled Oval  
Depolarized Nickel Anodes



From our complete line of Anodes and Plating Chemicals we call your attention to the following:

### ANODES

Nickel (all percentages)	Tin
Copper	Brass
Cadmium	Zinc

### CHEMICALS

Nickel Salts	Copper Sulphate
Nickel Chloride	Copper Cyanide
Nickel Carbonate	Copper Carbonate
Chromic Acid	Cadmium Oxide

Manufactured by

**THE MCGEAN CHEMICAL COMPANY**  
CLEVELAND, OHIO



# Metal Prices, August 25, 1938

(Import duties and taxes under U. S. Tariff Act of 1930, and Revenue Act of 1932)

## New Metals

COPPER: Lake, 10.25, Electrolytic, 10.125, Casting, 9.65.  
ZINC: Prime Western, 4.75. Brass Special, 4.85.  
TIN: Straits, 43.20. Lead: 4.75.  
ALUMINUM: 20. ANTIMONY, Ch. 14.00.  
NICKEL: Shot, 36. Elec., 35.

Duties: Copper, 4c. lb.; zinc, 1½c. lb.; tin, free; lead, 2½c. lb.; aluminum, 4c. lb.; antimony, 2c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth, 7½c.; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

QUICKSILVER: Flasks, 75 lbs., \$78. BISMUTH, \$1.05.  
CADMIUM, .75-\$1.05. SILVER, Troy oz., official pr. N. Y., Aug. 25, 42¾c.  
GOLD: Oz. Troy, Official U. S. Treasury price \$35.00.  
SCRAP GOLD, 6¾c. per pennyweight per karat, dealers' quotation.  
PLATINUM, oz. Troy \$36-39.

## Ingot Metals and Alloys

	Cents lb.	Duty	U. S. Import Tax*
No. 1 Yellow Brass	8.875	None	4c. lb. <sup>1</sup>
85-5-5-5	10.75	None	4c. lb. <sup>1</sup>
88-10-2	14	None	4c. lb. <sup>1</sup>
80-10-10	12.50	None	4c. lb. <sup>1</sup>
Manganese Bronze (60,000 t. s. min.)	10.875	None	4c. lb. <sup>1</sup>
Aluminum Bronze	15.125	None	4c. lb. <sup>1</sup>
Monel Metal Shot or Block	28	25% a. v.	None
Nickel Silver (12% Ni)	12.875	20% a. v.	4c. lb. <sup>1</sup>
Nickel Silver (15% Ni)	15.125	20% a. v.	4c. lb. <sup>1</sup>
No. 12 Aluminum	15.50-19	4c. lb.	None
Manganese Copper, Grade A (30%)	22-27	25% a. v.	3c. lb. <sup>1</sup>
Phosphor Copper, 10%	14.00	3c. lb.	4c. lb. <sup>1</sup>
Phosphor Copper, 15%	15.00	3c. lb.	4c. lb. <sup>1</sup>
Silicon Copper, 10%	21.50	45% a. v.	4c. lb. <sup>1</sup>
Phosphor Tin, no guarantee	50-60	None	None
Iridium Platinum, 5% (Nominal)	\$37.75	None	None
Iridium Platinum, 10% (Nominal)	\$39.50	None	None

\* Duty is under U. S. Tariff Act of 1930; tax under Section 60 (7) of Revenue Act of 1932.

<sup>1</sup> On copper content. <sup>2</sup> On total weight. "a. v." means ad valorem.

## Old Metals

Dealers' buying prices, wholesale quantities:	Cents lb.	Duty	U. S. Import Tax
Heavy copper and wire, mixed	7 to 7½	Free	4c. per pound on copper content
Light copper	6½ to 6½	Free	
Heavy yellow brass	4½ to 4½	Free	
Light brass	3¾ to 4	Free	
No. 1 composition	6½ to 6¾	Free	
Composition turnings	6½ to 6½	Free	
Heavy soft lead	4½ to 4½	2½c. lb.	
Old zinc	2½ to 2¾	1½c. lb.	
New zinc clips	3¼ to 3½	1½c. lb.	
Aluminum clips (new, soft)	12½ to 13	4c. lb.	
Scrap aluminum, cast	7 to 7½	4c. lb.	
Aluminum borings—turnings	4 to 4½	4c. lb.	None
No. 1 pewter	23 to 25	Free	
Electrotype	4½ to 4¾	2½c. lb.*	
Nickel anodes	27 to 28	10%	
Nickel clips, new	28 to 29	10%	
Monel scrap	8½ to 15	10% a. v.	

\* On lead content.

## Wrought Metals and Alloys

The following are net BASE PRICES per pound, to which must be added extras for size, shape, quantity, packing, etc., or discounts, as shown in manufacturers' lists, effective since July 29, 1938. Basic quantities on most rolled or drawn brass and bronze items below are from 2,000 to 5,000 pounds; on nickel silver, from 1,000 to 2,000 pounds.

### Copper Material

	Net base per lb.	Duty*
Sheet, hot rolled	18¼c.	2½c. lb.
Bare wire, soft, less than carloads	14¼c.	25% a. v.
Seamless tubing	18¾c.	7c. lb.

\* Each of the above subject to import tax of 4c. lb. in addition to duty under Revenue Act of 1932.

### Nickel Silver

Net base prices per lb. (Duty 30% ad valorem.)			
Sheet Metal		Wire and Rod	
10% Quality	25¼c.	10% Quality	27¾c.
15% Quality	26¾c.	15% Quality	31½c.
18% Quality	27¾c.	18% Quality	34 c.

### Aluminum Sheet and Coil

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, carload lots, per lb.	33.00c.
Aluminum coils, 24 ga., base price, carload lots, per lb.	28.50c.

### Rolled Nickel Sheet and Rod

Net Base Prices

Cold Drawn Rods	50c.	Standard Cold Rolled Sheet	49c.
Hot Rolled Rods	45c.		

### Monel Metal Sheet and Rod

Hot Rolled Rods (base)	35c.	No. 35 Sheets (base)	37c.
Cold Drawn Rods (base)	40c.	Std. Cold Rolled Sheets (base)	39c.

### Silver Sheet

Rolled sterling silver (Aug. 25) 45c. per Troy oz. upward according to quantity. (Duty, 65% ad valorem.)

### Brass and Bronze Material

Yellow Red Brass Comm'l.				
	Brass	80% Bronze	Duty	U. S. Import Tax
Sheet	16¾c.	17½c.	18¾	4c. lb.
Wire	17 c.	17¾c.	18½	20%
Rod	12¾c.	17¾c.	18½	4c. lb.
Angles, channels	25¼c.	26 c.	26¾	12c. lb.
Seamless tubing	19½c.	20 c.	20¾	8c. lb.
Open seam tubing	25¼c.	26 c.	26¾	20% a. v.

### Tobin Bronze and Muntz Metal

Net base prices per pound.		(Duty 4c. lb.; import tax 4c. lb. on copper content.)
Tobin Bronze Rod		18¾c.
Muntz or Yellow Rectangular and other sheathing		20 c.
Muntz or Yellow Metal Rod		16½c.

### Zinc and Lead Sheet

	Cents per lb.	Duty
Zinc sheet, carload lots standard sizes and gauges, at mill, less 7 per cent discount	9.75	2c. lb.
Zinc sheet, 1200 lb. lots (jobbers' prices)	10.75	2c. lb.
Zinc sheet, 100 lb. lots (jobbers' prices)	14.75	2c. lb.
Full Lead Sheet (base price)	7.75	2¾c. lb.
Cut Lead Sheet (base price)	8.00	2¾c. lb.

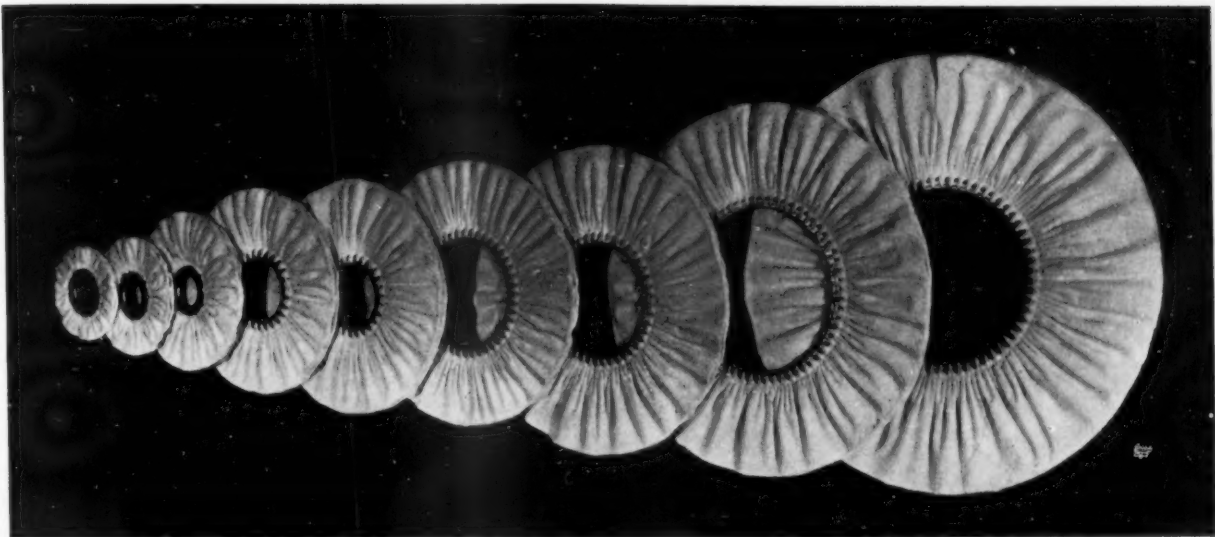
### Block Tin, Pewter and Britannia Sheet

(Duty Free)

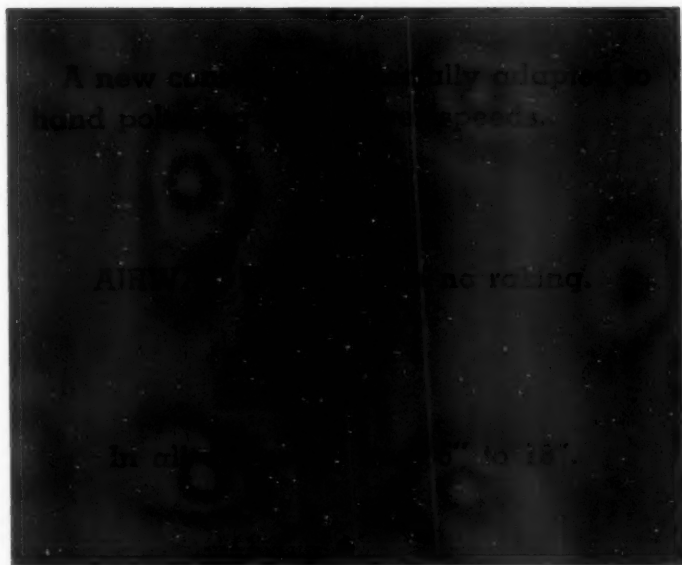
This list applies to either block tin or No. 1 Britannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f. o. b. mill:

500 lbs. over	15c. above N. Y. pig tin price
100 to 500 lbs.	17c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price

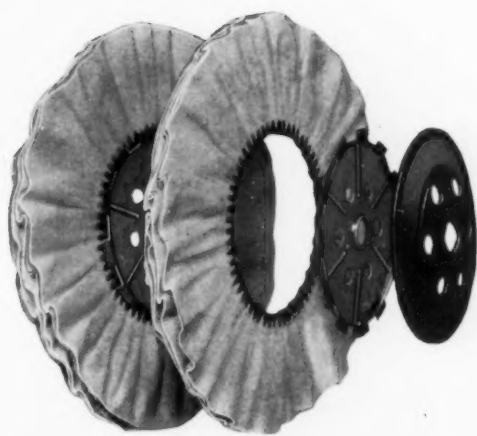
Supply Prices on page 456.



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